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November 1989

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# RAINBOW

THE COLOR COMPUTER MONTHLY MAGAZINE

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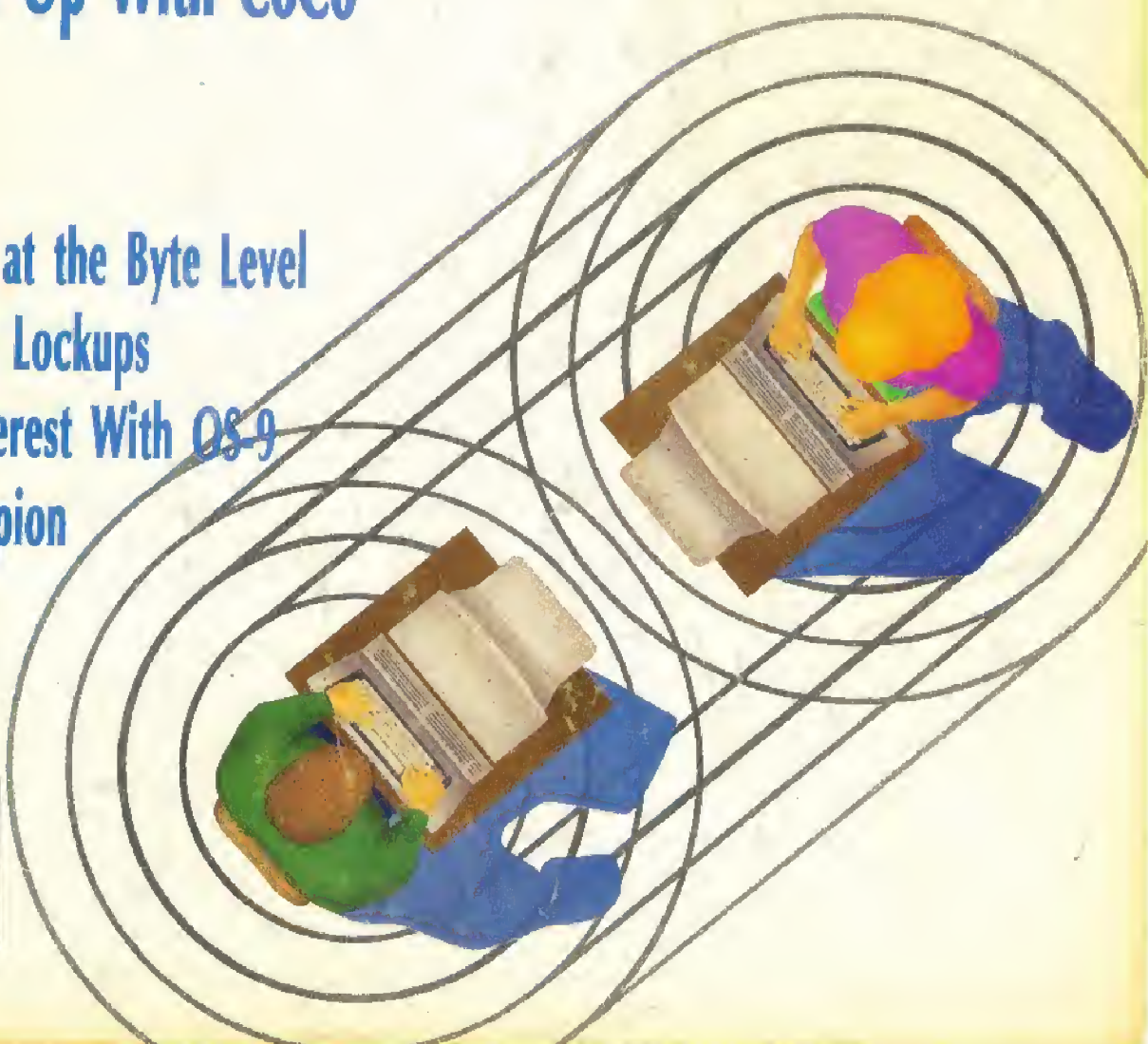
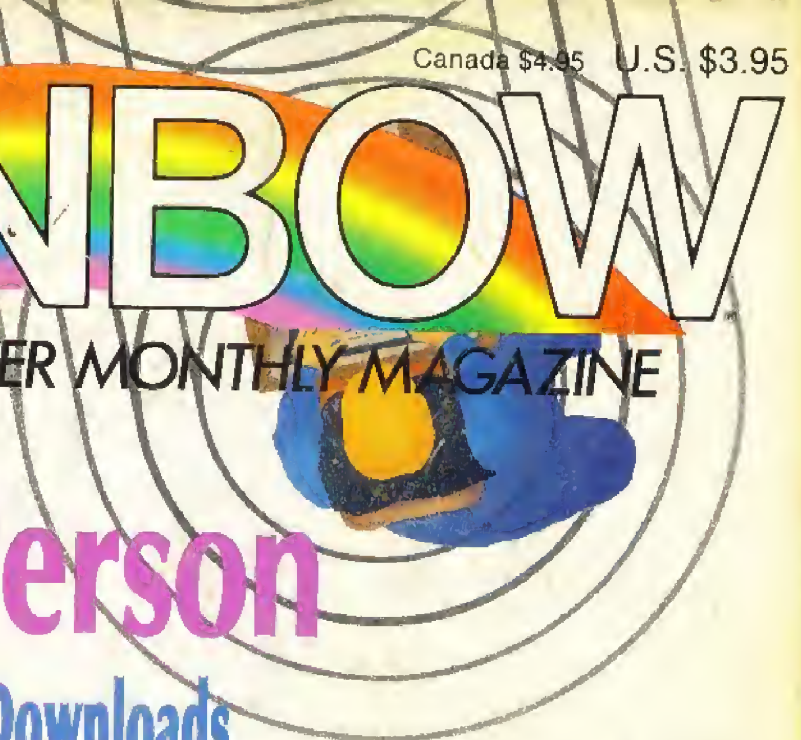
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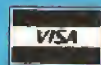


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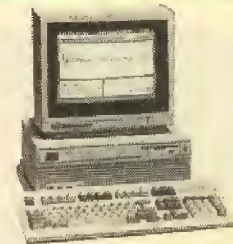
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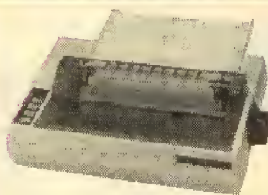
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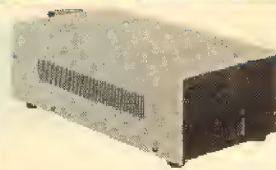
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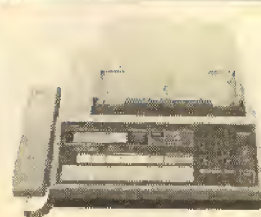
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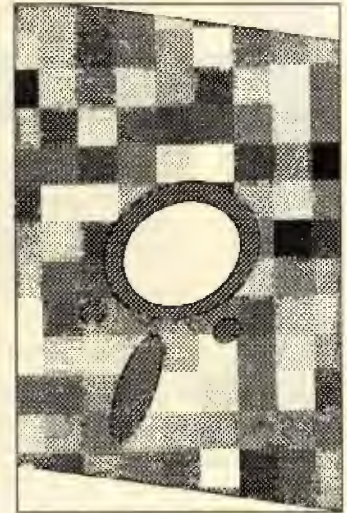
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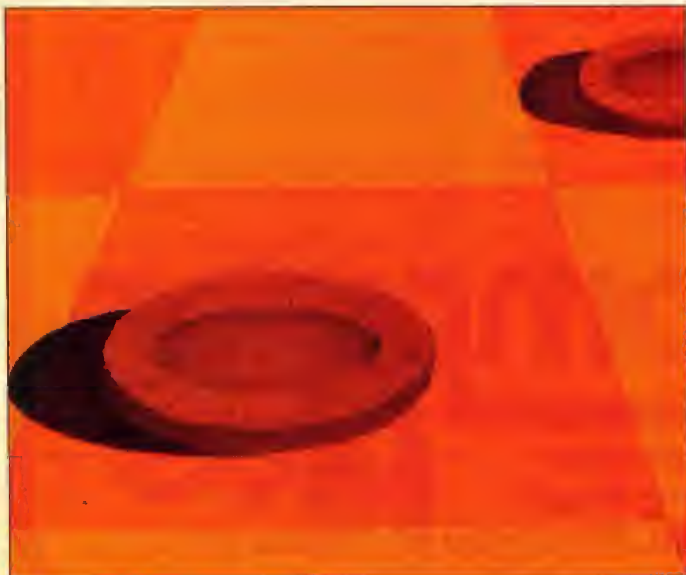
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The cassette tape/disk symbols beside features and columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE and RAINBOW ON DISK. Those with only the disk symbol are not available on RAINBOW ON TAPE. For details, check the RAINBOW ON TAPE and RAINBOW ON DISK ad on the inside front cover.

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Cover illustration by Heidi Nelson

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## Not Just for Programmers

Editor:

The "Doctor ASCII" section (Page 58) of the September, 1989 issue of RAINBOW contains a letter from Jack Williamson of Bellevue, Ohio. The letter refers to creating AIFs under *Multi-View*.

While we have no problem with making this information available to our customers and your readers, we feel some clarification is in order.

The second paragraph states: "The people at Tandy said that *Multi-View* was originally intended for program developers . . ." This is incorrect.

Enclosed is a copy of "Multi-View and Pre-Existing Applications," the documentation we provided to Mr. Williamson. As you can see in the initial paragraph, the reference to programmers simply pertained to the style in which the *Multi-View* documentation was written, not the expertise of the user.

The document is provided as a convenience to your readers. Feel free to use it in publication as you see fit.

Thomas J. Halliday  
Radio Shack  
Computer Customer Relations

Thank you for offering us "Multi-View and Pre-Existing Applications." We will be publishing it in the very near future.

## Microware's Secret

Editor:

Lately I have been using my CoCo 3 and OS-9 to write programs in FORTRAN-77. Wait! Did I say FORTRAN? I sure did! What about the August issue when William Barden wrote in his article "Computer Knowledge in Any Language" (Page 120) that "Languages such as COBOL, FORTRAN, PL/1, APL, Modula-2 and Smalltalk, although they are very popular in other segments of the computer world, are simply not available for the CoCo, . . . don't expect to see COBOL, FORTRAN or Ada on the CoCo."

The truth is FORTRAN-77 has been available for the CoCo 3 from Microware for some time now. I purchased the compiler in November of '88 at a price of \$250. Though

this is quite higher than any of the other languages for the CoCo, I had a specific use for it. It is an almost complete implementation of the language and uses the full subset of the ANSI standard.

Telephones at THE RAINBOW should be ringing off their hooks with calls from Microware protesting the unfair treatment its product has received from your magazine, though I doubt that is the case. Even Microware's brochures imply that FORTRAN-77 for the 6809 is currently not available as it is still under development. How can hardware/software developers expect their products to succeed if they will not make a commitment to market and support them? It is no wonder the CoCo is still underground, so to speak, when leading proponents such as Tandy and Microware take these positions.

Perhaps you can find room to publish an article about this language, giving it the equal recognition it deserves and making the CoCo community aware of another programming option. If it were not for THE RAINBOW, the CoCo possibly could have died a long time ago. So keep up the excellent job. I, for one, greatly appreciate the fine job all of you are doing in your offices at THE RAINBOW.

Herschel B. Elikor  
Houston

## Your Garden-Variety Users

Editor:

In the August '89 issue of THE RAINBOW (Page 80), Jeffrey S. Parker, in his tirade for OS-9, referred to a great many content Disk BASIC users as "RS-DOS potatoes." I, and I'm sure many others, greatly resent having been identified with this lowly vegetable. I would be pleased to no end if, in the future, Mr. Parker might at least limit his references to vegetables of a higher order. I would not be at all offended if, for instance, I were to be identified with an asparagus or cauliflower. Thank you very much.

John R. Hogerhuis  
Fullerton, California

*Touche! And 50 lashes with a wet broccoli stalk for us.*

## HINTS AND TIPS

Editor:

For a long time I couldn't get ON BRK GOTO and ON ERR GOTO working properly on my CoCo 3. I tried the commands in various locations in the program, but to no avail. Then I made the right guess.

PCLEAR and CLEAR statements appearing after ON BRK GOTO and ON ERR GOTO prevent them from working properly. Therefore, these statements have to appear after any CLEAR and PCLEAR statements. CLEAR and PCLEAR cause modifications to memory and the locations referred to by ON BRK GOTO and ON ERR GOTO are not adjusted properly.

I strongly suggest using ON BRK GOTO in your programs to GOTO a line containing a slow-speed poke if you are using the high-speed pokes. This way you won't damage your disks by saving the program while in the high-speed mode as I have done. Having BREAK immediately issue the slow-down poke can save a lot of important data.

David B. Smith  
Grand Portage, Minnesota

## Remedy for Numerous Disk Swaps

Editor:

I enjoyed your excellent review of *King's Quest III*. I think the people at Sierra should be congratulated for their work in computer graphics and hope to see more of their games released for the CoCo.

Although I agree that the numerous disk swaps necessary to play this game in its original format can be tiresome, I disagree with your opinion that the only remedy for this is a hard drive.

By following the instructions included with the game I was able to transfer the entire game onto three 40-track double-sided disks without much problem. In its original 35-track single-sided format there is a lot of repetition of files as many large files are needed on several disks. By reducing the number of disks the total amount of data is reduced considerably.

In the 40-track double-sided format the disk swaps become relatively infrequent and often provide a welcome break in the game.

I did encounter one problem, however.

# FALL BLOWOUT

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## CII Pages



by Walter Bayer

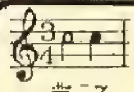
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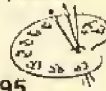
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By Kevin Berner

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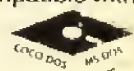
## DOS

**ADOS 3:** Advanced Operating System for the CoCo 3. Epromable. Only \$34.95 **ADOS** (CoCo 1,2): \$27.95 (Extended ADOS Might Be Avail by the time you read this!)

**RGB DOS:** Supports double sided drives, up to 2 hard drives & more. Epromable. Only \$29.95

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Transfer Programs between CoCo & IBM. Will Transfer Basic Programs & ASCII Files. Req DOS 3.2 or lower. Req. IBM Compatible with 2 drives. Only \$39.95



## Xenocopy

An amazingly versatile program that allows you to format/ duplicate / read/write disks between 300 different computers. For ex. you could transfer files between CoCo, IBM, NEC, Model 3, etc. Requires an IBM Compatible with 2 drives. Only \$79.95



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The instructions for updating the TOC file seemed a bit confusing. When I ran the game with a completely rewritten file the system locked up at the first disk swap. The solution was to edit the original file, changing only the disk and side numbers (change all side numbers to S1.) The game now works perfectly.

Changing the step rate to 6 milliseconds also provides a big improvement.

*Robert Zaker  
Loxahatchee, Florida*

## INFORMATION PLEASE

*Editor:*

I live in Williams, California, which is 60 miles north of Sacramento and 100 miles south of Redding on the map.

I am having trouble finding anyone in this area who sells OS-9-based shareware for the Color Computer 3. I was hoping someone in the CoCo world could help me.

The software I write is mainly mathematical in nature. I have a fluid engineering program, as well as a series on silicon chip design — many more are forthcoming. I would appreciate your assistance in finding a place to share my wares.

*John M. Sagers  
Williams, California*

*Contact the OS-9 Users Group at:*

*OS-9 Users Group  
1715 E. Fowler Ave.  
Suite R-237  
Tampa, FL 33612*

## The Best Of Both in One

*Editor:*

I am looking for a program that has the best things from both *ADOS-3* and *Basic Freedom*. For instance, it needs the ability to be customized like *ADOS-3*, including the possibility of setting up for 40- or 80-tracks, different drive speeds, etc. It needs to have the full-screen editing abilities of *Basic Freedom*, as well as automatic key-repeat. I need automatic line numbering (as per *ADOS*), and also to be able to enter programs and commands in lowercase (and true lowercase in the 32-column). It should also have all of the color commands from the 40-column screens available in the 32-column screen (*ATTR*, for instance).

Does anybody know of a program for the CoCo 3, be it public domain, share-

ware, or commercial? If you have something like this, please write me and I'll send you a disk and return postage. If you know of a commercial program that does all (or most of) this, please let me know what it is called, what it costs, and the name and address of the company.

*Jeff Byers  
124 Elizabeth St.  
East Peoria, IL 61611*

*See the review of Extended ADOS-3 in this (October) issue.*

## Making Life Easier

*Editor:*

The *Up-Down LIST* Utility program by Grahame Pollack in the July *RAINBOW* looks like just the thing to make my life a lot easier.

Does anybody have a patch or a modification so I can run it on my CoCo 3?

*Syd Tash  
1925 Tricentenaire, Apt. 204  
Montreal, QC Canada  
H1B 5S5*

## REQUEST HOTLINE

*Editor:*

I have acquired several duplicate issues of *THE RAINBOW* that I would like to swap for issues I am still missing. If any readers have January, February and March of '83 and December of '85, I would like to hear from them and possibly swap issues they are missing for these.

*Donald J. Briggs  
229 Holland St.  
Syracuse, NY 13204*

## KUDOS

*Editor:*

First of all, thanks for your fine publication. I would be lost without my *RAINBOW*. However, it is hard to find people locally who share my interest in the CoCo. I'm not a programmer or hacker, but consider myself a serious user, especially for my business. If anyone in the Greensboro, High Point or Burlington, North Carolina area knows of a group locally or would just like to correspond please let me know. I have 512K, OS-9, two drives, a printer, etc.

Secondly, I want to commend the manager of a local Radio Shack store in the Friendly Shopping Center, namely Ray

Wachter, for his help and support.

Finally, I would like to see more articles for the novice in *THE RAINBOW*. Most writers assume readers know more than they really do — at least I've felt that way at times. At any rate keep up the good work.

*Ron Russo  
1848 Pembroke Rd.  
Greensboro, NC 27408*

## A Bright Future Indeed

*Editor:*

I have to comment on the fine treatment from the people at Microcom Software. I recently bought two 30-Meg hard drives from them and encountered some difficulty in installing them in my system. Thanks to Chris Santwani who went over and beyond the call of duty, I now have two very good hard drives up and running on my system. As long as we have third-party vendors like Microcom Software, there is nothing but a bright future for the CoCo.

*George Barber  
Summit City, California*

## Another OS-9 Recruit

*Editor:*

I would like to tell you how much I enjoy *THE RAINBOW*. You have an excellent magazine. I have purchased many products advertised in the pages of *RAINBOW* and from reading "KISSable OS-9," I decided to purchase OS-9.

I also want to thank you for the series of articles you had on assembly language by William P. Nee. I like BASIC and other languages, but I really go for assembler. When I feel competent enough to do a small programming project, I would like to send it to *THE RAINBOW* to share with the CoCo community.

*John Collyer  
Medina, Ohio*

*We welcome your submission.*

**THE RAINBOW** welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoff Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG > prompt, type RAI to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW > prompt, type LET to reach the LETTERS > prompt and then select Letters for Publication. Be sure to include your complete name and address.



# Word Power 3.2

"... Just think of any word processing feature---chances are very likely that *Word Power* has it ... packs a lot of features ... excellent word processor..." - Rainbow's Word Processor Comparison Article "Deciding What's Right For You" April 1989 Rainbow, Page 26.

**More Versatile • More Powerful With Spooler • Calculator • Split-Screen • 2-Column Printing**

"... friendly...amazing execution speed...much easier to use than VIP software & 2 other word processing systems I've tried...very user-friendly...massive text storage capacity ...highest among word processors..." - Rainbow Oct. 88 Review for Word Power

**Unparalleled Power** packed in this 100% ML Word Processor written from scratch for the CoCo 3! No other word processor offers such a wide array of features that are easy to learn & use.

## DISPLAY & SPEED



Word Power 3.2 runs at double-clock speed and uses the **true 80-column display** with lowercase instead of the graphics screen. The result is lightning fast screen reformatting and added speed! **All prompts are displayed in plain English in neat colored windows.** The current column number, line number, page number, percentage of free memory is displayed at all times. Even the **page break** is displayed so you know where one page ends and the other begins. The Setup program allows you to change fore/background colors as well as (in)visible carriage returns. Word Power 3.2 can be used with RGB/Composite/Monochrome monitors as well as TV.

**MAXIMUM MEMORY** Word Power 3.2 gives you over 72K on 128K and over 450K on 512K CoCo 3 for Text Storage - more memory than any other CoCo word-processor. Period.



## EFFORTLESS EDITING

Word Power 3.2 has one of the **most powerful and user-friendly full-screen editor with word-wrap.** All you do is type. Word Power takes care of the text arrangement. The unique **Auto-Save** feature saves text to disk at regular intervals for peace of mind.

Insert/Overstrike Mode (Cursor Style Changes to indicate mode); OOPS Recall during delete; Type-ahead Buffer for fast typers; Key-Repeat (adjustable); Key-Click; 4-way cursor and scrolling; Cursor to beginning/end of text, beginning/end of line, top/bottom of screen, next/previous word; Page up/down; Delete character, previous/next word, to beginning/end of line, complete line, text before/after cursor; Locate/Replace with Wild-Card Search with auto/manual replace; Block Mark, Unmark, Copy, Move & Delete; Line Positioning (Center/Right Justified); Set/Reset 120 programmable tab stops; Word-Count; Define Top/Bottom/Left/Right margins & page length. You can also highlight text (underline-with on-screen underlining, bold, italics, superscripts, etc.). Word Power even has a **HELP** screen which can be accessed any time during edit.

**SPLIT-SCREEN EDITING** Splits the screen in half so you can view one portion of your text while you edit another. You'll love it!

## MAIL-MERGE

Ever try mailing out the same letter to 50 different people? Could be quite a chore. Not with Word Power 3.2! Using this feature, you can type a letter, follow it with a list of addresses and have Word Power print out personalized letters. It's that easy!

## MAIL-MERGE

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## CALCULATOR

Pop-up a 4-function calculator while you edit! Great for tables!

## SAVING/LOADING TEXT

Word Power 3.2 creates ASCII format files which are compatible with almost all terminal/spell-checking & other word-processing programs. Allows you to Display Free Space, Load, Save, Append & Kill files. The ARE YOU SURE? prompt prevents accidental overwriting & deletion. You can select files by simply cursoring through the disk directory. Supports double-sided drives & step-rates.

## PRINTING

Word Power 3.2 drives almost any printer (DMP, EPSON, GEMINI, OKIDATA, etc). Allows options such as baud rates, line spacing, page/print pause, partial print, page numbering/placement, linefeeds, multi-line headers/footers, right justification & number of copies. The values of these parameters & margins can be changed anytime in the text by embedding Printer Option Codes. The **WHAT YOU SEE IS WHAT YOU GET** feature allows you to preview the text on the screen as it will appear in print. You can view margins, page breaks, justification & more.

## PRINT SPOOLER

Why buy a hardware Print Spooler? Word Power 3.2 has a **built-in Spooler** which allows you to simultaneously edit one document & print another.

## TWO-COLUMN PRINTING

This unique feature allows you to print all or portion of your text in **two columns!** Create professional documents without hours of aligning text.

## SPELLING CHECKER



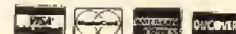
Word Power 3.2 comes with spelling checker/dictionary which finds & corrects mistakes in your text. You can add words to/delete words from dictionary.

## PUNCTUATION CHECKER

This checker will proofread your text for punctuation errors such as capitalization, double-words, spaces after periods/commas, and more. Its the perfect addition to any word processor.

## DOCUMENTATION

Word Power 3.2 comes with a well-written instruction manual & reference card which makes writing with Word Power a **piece of cake!** Word Power 3.2 comes on an UNPROTECTED disk and is compatible with RSDOS. Only \$79.95





## Spread the Word!

**T**ime to start telling your non-computer friends about the Color Computer again! CoCo 3s are selling now at a price of \$199 (expect a holiday-season special), but the really big news is a number of new items to choose from when you look at software — or firmware, anyway — from Tandy. I am talking about Nintendo software, which has certainly been a hot item for the last year or so.

There is some excellent software available for the CoCo — there has been for years. But now we are starting to see software available for other systems in formats that will run on our CoCos.

The question remains: Why would someone buy a pure game machine, a Nintendo for instance, if that software can also be found for a real computer? This is a question hundreds of thousands of Color Computer owners have asked for years. The answer is simple — the computer is the way to go!

All this is little-reported, but I think this is an important step for Tandy. Rather than porting games from other systems to the CoCo in a disk format, Tandy is buying the game software on ROMs and handling the import through the cartridge. It is simple, effective and costs less for development.

The advantages of the CoCo have always been low cost, easy expansion and power. This move by Tandy increases the advantage of the Color Computer we use today — it is a major plus.

So, I think it *is* time to point this out to neighbors and friends who haven't yet joined the world of computer users. They'll get a computer that plays games as well — sort of like having your cake and eating it too! The benefit of owning a computer with the power and software base of the CoCo — especially at the price — is difficult to beat.

\* \* \* \* \*

While Tandy was making some changes, so were we here at THE RAINBOW.

As I wrote last month, Cray Augsburg has replaced Jutta Kapfhammer as managing editor. And as I mentioned, Cray brings a wealth of technical expertise with him to the post, having been technical editor for THE RAINBOW before his promotion.

The change, however, left us with an opening that needed to be filled. I am pleased to announce that it has been filled most ably by Greg Law, a name I am sure many of you recognize for his OS-9 expertise, his contributions to this magazine and his work on Delphi.

One of the reasons for asking Greg to move from Warner Robbins, Georgia, to Prospect is that we want to incorporate a slightly higher-level technical ability into THE RAINBOW. As I said last month, we have no intention of abandoning the games, graphics, beginner's information and the like. Our surveys have shown these are the most popular features of THE RAINBOW.

But we also understand that many of you are more technically oriented. Some of you started that way, and some of you have acquired it over years of working with your CoCo. While we have always provided an abundance of technical information, we now have the ability to produce more.

I think all of you will be pleased with the changes we are making to THE RAINBOW. I have always seen this magazine as an evolving publication. And if it is to continue to serve you best, it must *constantly* evolve.

— Lonnie Falk

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BOTH ECB AND DISK BASIC UNRAVELLED: \$49.95

SUPER EXTENDED BASIC UNRAVELLED: SUPER EXTENDED BASIC ROM Disassembly for CoCo 3. \$24.95

COMPLETE UNRAVELLED SERIES (all 3 books): \$59.95

## COCO LIBRARY

CoCo 3 Service Manual: \$39.95

CoCo 2 Service Manual: \$29.95

Start OS9 Book + Disk: \$32.99

Inside OS9 Level II: \$19.95

Rainbow Guide To OS9 Level II: \$19.95

Rainbow Guide To OS9 Level II Disk: \$19.95

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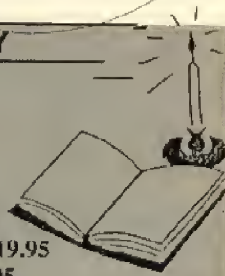
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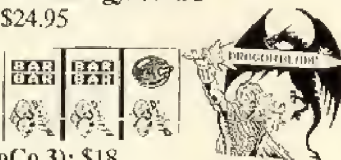
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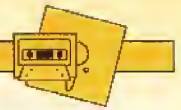


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*dit dit dit dab dab dab dit dit dit . . .*

# An Old Code in a New Mode

By Ray Onley

Since computers were invented, people have been coming up with all kinds of training programs to help others learn and use international Morse code. Many philosophies on learning code were adopted and have stood the test of time. *CodeMaster* is a new program that incorporates those philosophies along with new ideas.

### Program Objectives

One of *CodeMaster's* objectives is to offer a serious Morse code training program to CoCo users who have discovered that today's radio communications software is dominated by PC clones and older Commodore systems that had a head start in the amateur radio community. Another objective is to offer true choices among the various strategies for mastering modern Morse communication.

Ideas differ about the best way to learn the International Morse code, a skill required for amateur radio licenses as well as certain U.S. military and communications industry careers. A primary consideration in designing *CodeMaster* was to give you choices among most of the popular systems for learning to copy Morse code transmissions at various speeds.

Some radio professionals believe the best method is to be able to perfectly copy random groups of five letters, numerals or types of punctuation, which is the traditional format for code tests. Others think

copying intelligible text is more helpful. A number prefer classroom-style practice sessions in contrast to those who encourage private practice or one-on-one tutoring sessions. Some believe any text material is fine for practice while others suggest a concentration on communications language and abbreviations. A recently developed technique starts the transmission at a very high speed to help get your brain in motion. Then it gradually slows to the desired speed.

| International Morse Code |          |          |                    |
|--------------------------|----------|----------|--------------------|
| A                        | .-       | N        | -. .               |
| B                        | -... .   | O        | ---                |
| C                        | -.-. .   | P        | ---. .             |
| D                        | -.. .    | Q        | ---. .             |
| E                        | . . .    | R        | -. . .             |
| F                        | ..-. .   | S        | ... .              |
| G                        | -. -. .  | T        | - . .              |
| H                        | .... .   | U        | .. - .             |
| I                        | .. . .   | V        | ... - .            |
| J                        | -. - - . | W        | -. . - .           |
| K                        | - . - .  | X        | - . - . -          |
| L                        | -. . . . | Y        | -. - - .           |
| M                        | -- . .   | Z        | --- . .            |
| 1                        | .....    | period   | .-.-.-.            |
| 2                        | .....    | comma    | -.-.-. .           |
| 3                        | .....    | ?        | ..-.-.-.           |
| 4                        | .....    | error    | ..-.-.-.           |
| 5                        | .....    | dash     | -.-.-. .           |
| 6                        | .....    | wait     | ..-.-. . (send AS) |
| 7                        | .....    | end msg  | -.-.-. . (send AR) |
| 8                        | .....    | transmit | -.-. . (send K)    |
| 9                        | .....    | sign off | ..-.-. . (send SK) |
| 0                        | .....    |          |                    |

### Starting the Program

After you type RUN and the title screen appears, answer the "Keyboard or Joy-

stick" question by pressing K for keyboard or J for joystick. If you press ENTER, the joystick input is selected as the default. Then the command menu appears. This is the main menu that controls all the routines and options offered by this program. The four different control routines are described below.

### Take Test Routine

This is the main test-taking routine. It is to be selected after changing the speed, performing the test, and after setting whatever options you want. In most tests you are asked how long you want the test to be. This number represents the test length in words; if you entered 5 in the random call sign test, it would send five groups of letters. After the test is underway, you can pause by typing P or stop by pressing CLEAR.

### Change Speed Menu

This routine allows you to change the speed at which you are tested. The different word-per-minute (WPMs) levels are explained below:

- 3 WPM — speed used by those just starting out.
- 5 WPM — minimum skill level for passing novice test.
- 7 WPM — suggested proficiency level before novice test.
- 10 WPM — typical ability of experienced novice.
- 13 WPM — minimum skill for passing general class test.
- 17 WPM — suggested proficiency level before general test.
- 21 WPM — a taste of amateur extra class proficiency.

### Change Test Menu

This routine allows you to choose the form with which you want to be tested. The seven test options are explained below:

#### 1) Random Characters

This is the classic hard-core test of code proficiency. Nothing you hear makes any sense. You hear a random mix of letters, numbers and some punctuation in groups of five, generated at any speed you choose. This means you need to be sharp with periods and commas but do not need to worry about brackets, parentheses and other characters that exist but are never used.

#### 2) Random Call Signs

Recognizing worldwide station call signs is an operating skill fundamental to actual amateur radio communications. This op-

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(For CoCo 1,2,3 RSDOS; Min 32K Unless Otherwise Specified)

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Transfers Tape-To-Disk, Disk-to-Tape, Disk-to-Disk, Tape-To-Tape. Only \$24.95 \$19.95

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32/40/80 column, PMODE 3/4 dump. Allows you to take snapshots of screens while program is running! For DMP & Epson/Gemini/Star & Compatibles. Only \$19.95 \$14.95 (CoCo2 compatible)

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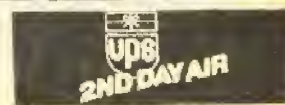
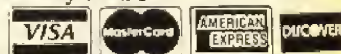
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tion generates whatever number of random call signs you select. You can expect to understand each call sign. Each consists of one or two letters (the prefix), a number, and one to three letters (the suffix). The prefix designates the country issuing the license, the number usually designates the geographical region within that country, and the suffix identifies the particular station — just like the last four digits of your telephone number. For a list of what the prefixes mean, check the ARRL operating manual, which is available at local amateur radio stores.

### 3) Translate Data File

This feature permits you to convert any CoCo ASCII text file into Morse code. This is the do-it-yourself option of this program. You can use any of your existing text files as practice material, or you can create your own test using almost any word processor.

### 4) Character Help

Sometimes it can help to just listen to what you choose to transmit whether it's a single letter, radio abbreviation or other word. Press any key on your keyboard, and you can hear the Morse code version at the speed you have chosen.

### 5) Character Test

This tests character-by-character. When the test starts, you hear a code character and the computer asks which character you heard. If your answer is incorrect, you are shown the character sent and your incorrect answer. After this, press any key to hear the next letter. Your score is displayed after the test.

### 6) QSO Help

A QSO is a two-way communication between amateur radio stations. This option gives you practice in recognizing short words and abbreviations commonly used in actual communication. It is desirable to learn to hear these common expressions as a single unit rather than as a series of individual letters that you have to think about. For example, you can practice understanding QRL? as the message asking if a particular frequency is occupied, in contrast to writing down the characters Q,R,L and ? and then translating them. The data line for this program feature contains all the simple on-the-air communications expressions typically used.

### 7) Contest Simulation

This option simulates an amateur radio operating event in which random stations call CQ TEST (which means *calling any station interested in this contest*) and then they receive answers from other randomly-

generated amateur station call signs. The answering stations are heard on a slightly different audio frequency, simulating typical listening conditions on a radio receiver.

When answering the test length question for this test, you give a number representing the amount of entire contacts. These contacts last about one minute at 13 WPM.

#### Sample Exchange:

Originating station (lower tone):

CQ CQ TEST DE KA8RZP K

[Meaning: Calling any station in this contest from KA8RZP.]

Answering station (higher tone):

KA8RZP DE OA6OAF

[Meaning: KA8RZP, this is OA6OAF.]

Originating station:

OA6OAF DE KA8RZP R R NR 774 RST 559 BK

[Meaning: Roger, Roger, your contest serial number is 774 and your signal report is 559. Break.]

Answering station:

QSL NR 663 RST 579 BK

[Meaning: I confirm your transmission. Your serial number is 663 and your signal report is 579. Break.]

Originating station:

QSL 73 SK

[Meaning: I confirm your transmission. Best regards. Break.]

Divider (program-generated) among complete exchanges (lowest tone):

BT ( - . . . - )

[Meaning: a pause that occurs during a code conversation.]

After this pause a newly generated originating station calls CQ TEST and receives a reply from a new station. It should be noted that all the numbers and call signs given are samples and that they are different every time. The call sign prefix, however, means a specific country; for example, K means the United States.

Extensive practice with this option helps you become ready for contest-style radio communications at higher code speeds than you think you can handle. Then you find your next license code exam much less intimidating.

#### Option Menu

This menu allows you to control the features that affect the rest of the program. These are the five different options:

● Descending Speed — a newly created testing procedure in which the program

starts out at a very fast speed and then evenly descends to a desired speed. The theory behind this is that the higher speed sets your brain in motion; when the speed slows down, you find you can handle code a bit faster than you thought you could.

To use this, select the descending speed option. You see an overlapping window pop in. I suggest you answer the "Start Speed" question by entering a speed two to three times what you can handle. Also answer the "End Speed" question by entering a speed slightly faster than what you think you can handle. This feature is effective in all seven tests.

● Ascending Speed — This option uses the converse of the theory above. I suggest you use a start speed of about what you can handle, maybe a little slower. And for the end speed, enter twice the speed you can handle. If those speeds don't work for you, play with them. Maybe you can find a set of numbers perfect for your needs.

● Dec./Acc Speed Off — Selecting this shuts off the descending and ascending speed options.

● Toggle Random Tones — This option changes the tone of the code sent every word. This helps simulate actual listing conditions heard on a receiver. With this feature get used to the different tones so you learn not to get thrown off when hearing a sudden tone change such as you would encounter on a receiver.

● Toggle Keyboard and Joystick — Selecting this changes the control input device from keyboard to joystick and vice versa.

● Display Line — This option shows what line is currently being sent and highlights the individual character being sent. This option does not work on the Character Help and Character Test testing routines.

● Command Menu — Selecting this brings you back to the command menu.

#### Formation of Morse Code Characters

The ratio of dots (dits), dashes (dahs), and spaces between each element (dit or dah), character or word, is controlled by variables in the program. I chose to make these spacings user friendly, not exactly following the classic mechanical proportions of length for spacing. This means the sending speed of each character is a little faster, with a bit more space between characters and words. This same practical adjustment is made in many, but not all, license exams administered by Volunteer Examiners (VEs).

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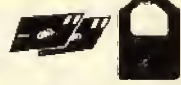
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**ups**  
**2ND DAY AIR**

Line 120 of the program controls some of these values, and you may wish to try your hand at lightly adjusting them:

- Dits — T1
- Dahs — T2
- Spacing between dits and dahs — P1
- Spacing between characters — P2
- Spacing between words — P3

The above adjustments control their respective lengths proportionally. This means that changing any of these numbers alters the lengths on all speeds. To change

the lengths for each individual speed, the numbers in Line 800 must be changed. Line 800 is set up in groups of three numbers. The first of these numbers is the actual word-per-minute speed. The second number is the base timing unit for the elements. Changing this number proportionally changes the lengths of both the dits and the dahs. The smaller this number is, the longer the dit or the dah. The third number in the group is the base unit for the spacing. Altering this number changes the lengths of all the spaces. Be very careful in adjusting these numbers because any radical

change might throw the timing off, making the indicated speed inaccurate.

I tried to design this program so it is practical, easy to use and fun. There are many options and features in the program that I encourage you to try. Try to push yourself into higher code speeds so you can upgrade your license and explore more in the world of amateur radio.

*(Questions or comments concerning this article may be addressed to the author at 810 Cascade Road, Cincinnati, OH 45240. Please enclose an SASE when requesting a reply.)* □

|   |      |       |     |
|---|------|-------|-----|
| ✓ | 240  | ..... | 23  |
|   | 480  | ..... | 220 |
|   | 700  | ..... | 67  |
|   | 840  | ..... | 177 |
|   | 1050 | ....  | 135 |
|   | 1230 | ..... | 89  |
|   | 1480 | ..... | 159 |
|   | 1700 | ....  | 218 |
|   | 1910 | ..... | 236 |
|   | 2140 | ..... | 186 |
|   | END  | ..... | 35  |

**The listing:** CODEMSTR

```

0 ' COPYRIGHT 1989 FALSOFT, INC
10 CLS:HL=32:VL=8:FOR TM=0 TO 66
STEP 33:GOSUB 920:HL=HL-2:VL=VL-1:NEXT
20 PRINT@105,"CODEMASTER I";:X=1
123:X1=25:GOSUB 900
30 PRINT@135,"BY RAY ONLEY 8/88"
::X=1155:GOSUB 900
40 TM=297:HL=14:VL=3:GOSUB 920:P
RINT@330,"LOADING DATA";
50 CLEAR5000:DIM W$(200),L$(48),
W$(37),C$(15),C1$(60)
60 FOR X=1 TO 47:READ L$(X):NEXT
70 FOR X=1 TO 36:READ W1$(X):NEX
T
80 FOR X=1 TO15:READ C$(X):NEXT
90 FOR X=1 TO 7:READ W(1,X),W(2,
X),W(3,X):NEXT
100 FORX=1TO 58:READ C1$(X):NEXT
110 FOR X=1 TO 7:READ T$(X):NEXT
120 T1=1:T2=3:P1=4:P2=28:P3=75:P
LAY"03":B$=CHR$(128):N=1:WPM=13:
U=16:U2=2:T$="A"
130 PRINT@416,,:INPUT"KEYBOARD O
R JOYSTICK (K OR J)";K$
140 IF K$="K" THEN KJ=1
150 'MAIN MENU
160 CLS:PRINTB$B$"command"B$men
u"B$B$
170 PRINT STRING$(16,239)
180 PRINT" TAKE TEST":PRINT"
CHANGE SPEED
190 PRINT" CHANGE TEST":PRINT"
OPTIONS
200 TM=17:HL=15:VL=6:GOSUB 920
210 PRINT@51,"SPEED =WPM;
220 PRINT@83," TEST MODE:":PRIN
T@115,LEFT$(T$(N),11);
230 PRINT@147,"CONTROL:":IF KJ=
1 THEN PRINT"KEY": ELSE PRINT"JO
Y";

```

```

240 J1=14:J3=1088:X1=15:GOSUB 16
70
250 ON L+1 GOTO 970,1500,1750,19
30
260 'GENERATE RND CHARACTORS
270 FOR Y=1 TO K:W$(Y)="":F
OR X=1 TO 5
280 R=RND(90):IF R<44 THEN 280
290 IF R>57 AND R<65 THEN 280
300 MID$(W$(Y),X,1)=CHR$(R):NEXT
X,Y
310 'TEXT-TO-CODE ROUTINE
320 TM=352:HL=32:VL=3:GOSUB 920:
PRINT@385,"PRESS ANY KEY TO STAR
T TEST...":EXEC 44539:GOSUB960
330 GOSUB 960:TM=228:HL=12:VL=3:
GOSUB 920:PRINT@261,"TESTING..."
;
340 IF RT=0 THEN T$="A"
350 SF=(SS-ES)/K
360 OM=((SS+ES)/2)*.06
370 IF DL=1 THEN TM=352:HL=32:VL
=3:GOSUB 920
380 IF F=3 THEN 1230
390 IF F=2 THEN U=SS+OM:U2=INT(5
0/U)
400 FOR V=1 TO K:IF DS=1 OR IS=1
THEN U=U-SF:U2=INT(50/U)
410 IF F=2 THEN PRINT@58,INT(U/O
M);
420 IF RT=1 THEN T$=CHR$(64+RND(
7))
430 PRINT@385,STRING$(29,32);
440 IF DL=1 THEN PRINT@385,LEFT$
(W$(V),29);:IF LEN(W$(V))>29 THE
NF=7
450 FOR Y=1 TO LEN(W$(V))
460 IF Y>29 THEN O=Y-29 ELSEO=Y
470 IF DL=1 AND PEEK(O+1408)<64
THEN AN=64 ELSE AN=-64
480 IF SL=1 OR Y=1 THEN SL=0:GOT
O 500
490 IF DL=1 THEN POKE O+1407,Q
500 IF DL=1 THEN Q=PEEK(O+1408):
POKE O+1408,Q+AN
510 IF DL=1 AND Y=29 THEN PRINT@
385,STRING$(29,32);:PRINT@385,MI
D$(W$(V),30,29);:SL=1
520 A$=INKEY$:IF A$=CHR$(12) THE
N 160
530 IF A$="P" THEN EXEC 44539
540 N$=MID$(W$(V),Y,1)
550 IF N$="" THEN 650
560 A=ASC(N$)
570 IF A>97 AND A<123 THEN A=A-3
2
580 IF A<45 OR A>90 THEN 650
590 N1$=L$(A-43)
600 FOR X=1 TO LEN(N1$)
610 N2$=MID$(N1$,X,1)

```

```

620 IF N2$="Z" THEN PLAY"L"+SIR$
(INT(U*T1))+T$:GOTO640
630 PLAY"L"+STR$(INT(U*T2))+T$
640 FORT=1TOP1*U2:NEXT T,X
650 IF F=1 THEN RETURN
660 FOR T=1 TO P2*U2:NEXT T,Y
670 IF F=3 THEN FOR T=1 TO 450:N
EXT:RETURN
680 FOR T=1 TO P3*U2:NEXT T,V
690 IF F=2 THEN WPM=ES
700 PRINT@352,STRING$(100,32)
710 TM=353:HL=30:VL=3:GOSUB 920:
PRINT@386,"PRESS ANY KEY FOR ANS
WERS...":EXEC 44539
720 IF N=3 OR N=7 THEN 1550
730 FOR LY=1 TO INT(K/15)-1
740 CLS:FOR X=1 TO 30:Z1=(LY-1)*
30+X:PRINT STR$(Z1);") W$(Z1):.
NEXT:EXEC 44539:NEXT:GOTO 160
750 GOTO 50
760 'DATA
770 DATA ZXXZZZ,,XZXZXZ,ZXXZX,ZZ
ZZZ,XZZZZ,XZZZZ,XXXZZ,XXXZX,XXXX
X,ZXXXX,ZZXXX,ZZZXX,ZZZZX,ZZZXXX
,ZZXZXZ,ZZXZX,ZXXXZ,ZZXZXZ,XXZXX
X,,XZ,ZXXX,ZXZX,ZXX,X,XXZX,ZZX,X
XXX,XX,XZZZ,ZXZ,XZXX,ZZ,ZX,ZZZ,X
ZZX,ZZXZ,XZX,XXX,Z,XXZ,XXXZ,XZZ,
ZXXZ,ZXZZ,ZZXX
780 DATA CQXQ,CQDX,CQTEST,CQCHES
S,QST,QRZ?,QRT,QRX,PSEQSY,PSEQSL
,ORL?,RST479,NAME,OP,HR,QTH,RIG,
RIGITTW,ANT,WX,QSL,73,88,CUL,CUA
GN,SK,HW?,BK,KN,CL,FB,PSEORS,QRN
,ORM,QSB,RST5NN
790 DATA AKRON OH,MONTGOMERY AL,
ALBANY GA,NEW HAVEN CN,COLUMBIA
SC,SPRINGFIELD MS,GRAND RAPIDS M
I,FLAGSTAFF AZ,MESA AZ,OWENSBORO
KY,CINCINNATI OH,NASHVILLE TN,D
AYTONA BEACH FL,MIAMI FL,INDIANA
POLIS IN
800 DATA 3,2,8,5,4,5,7,7,4,10,14
,4,13,16,2,17,20,1,21,26,1
810 DATA K,A,N,W,KB,KA,WA,AA,AB,
AC,KC,WB,CE,CO,CP,CT,DL,DK,EA,EI
,F,G,GN,GW,GI,HA,HB,HC,HK,I,IK,J
A,LA,LU,LZ,OA,OE,OH,OK,ON,OZ,PA,
PP,PY,SM,SP,SV,TF,UA,UB,VE,VK,VP
,XE,YN,YU,YV,YO
820 DATA RANDOM CHARACTORS,RANDO
M CALLSIGNS,TRANSLATE DATA,CHARA
CTOR HELP,CHARACTOR TEST,QSO HEL
P,CONTEST SIMULATION
830 'KEYBOARD ROUTINE
840 F=1:Z=1:Y=1
850 TM=321:HL=30:VL=4:GOSUB920:P
RINT@354,"PRESS KEY TO HEAR CHAR
ACTOR":PRINT@389,"PRESS CLEAR T
O EXIT";

```



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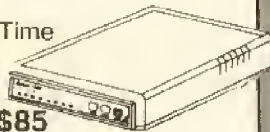
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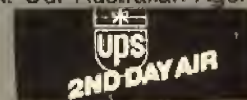


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```

860 W$=INKEY$:IF W$="" THEN 860
870 IF W$=CHR$(12) THEN F=0:GOTO
160
880 N$=W$:GOSUB 560
890 GOTO 860
900 POKE X,128:FOR Z=X+1 TO X+X1
:POKE Z,PEEK(Z)-64:NEXT:RETURN
910 'WINDOWING ROUTINE
920 CN=RND(8)*16-16:VL=VL-1
930 PRINT@TM,CHR$(142+CN)::PRINT
STRING$(HL-2,140+CN)::PRINTCHR$(
141+CN);
940 FOR X=1 TO VL:Z=TM+X*32:PRIN
T@Z,CHR$(138+CN)::PRINT@Z+HL-1,C
HR$(133+CN)::NEXT
950 PRINT@TM+32*VL,CHR$(139+CN);
STRING$(HL-2,131+CN)::PRINTCHR$(
135+CN)::RETURN
960 FOR X=0 TO VL:PRINT@TM+32*X.
STRING$(HL,32)::NEXT:RETURN
970 FOR ZZ=1 TO K:W$(ZZ)="" :NEXT
980 IF N=4 THEN 840 ELSE IF N=3
THEN 1030 ELSE TM=358:HL=18:VL=3
:GOSUB 920
990 PRINT@391,"TEST LENGTH: ";:L
INEINPUT K$:IF K$="" THEN 160 EL
SE K=VAL(K$)
1000 IF N=5 THEN 1030
1010 TM=358:HL=20:VL=3:GOSUB920:
PRINT@391,"GENERATING TEST...":
1020 IF F=2 THEN PRINT@58,SS;
1030 ON N GOTO 260,1050,1120,840
,2180,1200,1210
1040 'CALLSIGN ROUTINE
1050 FOR Y=1 TO K
1060 Z$=C1$(RND(59))
1070 Z1$=MID$(STR$(RND(10))-1),2.
1)
1080 FOR X=1 TO RND(3):Z2$(X)=CH
R$(64+RND(26)):NEXT
1090 W$(Y)=Z$+Z1$+Z2$(1)+Z2$(2)+
Z2$(3)
1100 NEXT:IF F=3 THEN 1250ELSE32
0
1110 'LOAD ASCII FILE
1120 TM=356:HL=24:VL=3:GOSUB 920
:PRINT@389,,:LINEINPUT"FILE NAME
":F$
1130 IF F$="" THEN 160
1140 IF LEN(F$)>8 AND INSTR(F$,"
.")<1 THEN 1120
1150 TM=353:HL=30:VL=3:GOSUB 920
:PRINT@386,,:LINEINPUT"CASSETTE
OR DISK (C OR D)?:":CD$
1160 IF CD$="C"THEN CD=-1 ELSE C
D=1
1170 OPEN "I",CD,F$:K=0
1180 K=K+1:IF EOF(CD)=-1 THEN CL
OSE:GOTO 320
1190 INPUT#CD,W$(K):GOTO 1180
1200 FOR X=1 TO K:W$(X)=W1$(RND(
36)):NEXT:GOTO 320
1210 F=3:GOTO320
1220 ' CONTEST SIMULATION
1230 FOR ZZ=0 TO K-1
1240 K=2:GOTO 1050
1250 C1$=W$(1):C2$=W$(2)
1260 M=8*ZZ
1270 W$(1)="CQ TEST DE "+C1$+" K
":V=1:T$="A":GOSUB 430
1280 FMM$=W$(1)
1290 W$(2+M)=W$(1)
1300 W$(1)=C1$+" DE "+C2$:T$="B"
:GOSUB 430
1310 W$(3+M)=W$(1)
1320 W$(1)=C2$+" R R NR"+STR$(RN
D(9))+STR$(RND(9))+STR$(RND(9)):

```

```

T$="A":GOSUB 430
1330 W$(4+M)=W$(1)
1340 IF RND(10)<7 THEN R1=5 ELSE
R1=RND(5):IF R1<2 THEN 1340
1350 R2=RND(9):IF R2<5 AND R1>3
THEN 1350
1360 W$(1)="RST"+STR$(R1)+STR$(R
2)+"9 BK":GOSUB 430
1370 W$(5+M)=W$(1)
1380 W$(1)="QSL NR"+STR$(RND(9))
+STR$(RND(9))+STR$(RND(9)):T$="B
":GOSUB 430
1390 W$(6+M)=W$(1)
1400 IF RND(10)<7 THEN R1=5 ELSE
R1=RND(5):IF R1<2 THEN 1400
1410 R2=RND(9):IF R2<5 AND R1>3
THEN 1410
1420 W$(1)="RST"+STR$(R1)+STR$(R
2)+"9 BK":GOSUB 430
1430 W$(7+M)=W$(1)
1440 W$(1)="QSL 73 SK":T$="A":GO
SUB 430
1450 W$(8+M)=W$(1)
1460 W$(1)="":T$="C":GOSUB 430
1470 NEXT:W$(1)="" :W$(2)=FMM$
1480 F=0:K=ZZ*8:GOTO 1560
1490 'CHANGE SPEED
1500 FOR X=0 TO 6:PRINT@274+(X*3
2),W(1,X+1)::NEXT
1510 TM=240:HL=6:VL=9:GOSUB 920
1520 J1=25:J3=1297:X1=3:GOSUB 16
70
1530 L=L+1:WPM=W(1,L):U=W(2,L):U
2=W(3,L)
1540 GOTO 160
1550 'LIST ANSWERS
1560 CLS:PRINT@7,"CODE TEST ANSW
ERS":PRINTSTRING$(32,175)::C=0
1570 FOR X=1 TO K
1580 C1=INT(LEN(W$(X))/32)+1:C=C
+C1:IF C>13 THEN C=0:GOTO 1610
1590 IF LEN(W$(X))>C1*32 THEN C=
C+1
1600 PRINT W$(X):GOTO 1640
1610 A$=INKEY$:IF A$=""THEN1610
1620 IF A$=CHR$(12) THEN 160
1630 FOR S=2 TO 14:PRINT@32*S,ST
RING$(32,32)::NEXT:PRINT@64,;
1640 NEXT X
1650 EXEC 44539:GOTO 160
1660 'JOYSTICK INPUT
1670 IF KJ=1 THEN KI=0:GOTO 1810
1680 J2=INT(64/(J1/4))
1690 H=JOYSTK(0):V=JOYSTK(1)
1700 X=J3+INT(V/J2)*32:POKE X,12
7+(16*RND(8)):FOR T=1 TO 50:NEXT
:POKE X,143
1710 IF INKEY$=CHR$(12) THEN160
1720 P=PEEK(65280):IF P=254 OR P
=126 GOSUB 900:L=INT(V/J2):RETUR
N
1730 GOTO 1670
1740 'CHANGE TEST
1750 TM=228:HL=23:VL=9:GOSUB920
1760 ZZ=263:FOR X=0 TO
6:Z1=ZZ+(X*32)
1770 PRINT@Z1,T$(X+1)::NEXT
1780 J3=1285:J1=25:X1=20:GOSUB 1
670
1790 N=L+1:GOTO 160
1800 'KEYBOARD INPUT
1810 X=J3+KI:POKE X,127+(16*RND(
8)):FOR T=1 TO 50:NEXT
1820 A$=INKEY$:IF A$=""THEN1810
1830 POKE X,143
1840 IFA$=CHR$(94)THEN KI=KI-32
1850 IFA$=CHR$(10)THEN KI=KI+32

```

```

1860 IF A$=CHR$(13) THEN GOSUB 9
00:L=KI/32:RETURN
1870 IF KI<0 THEN KI=0
1880 IF KI>J1/4*32 THEN KI=KI-32
1890 GOTO 1810
1900 'TOGGLE KEY. & JOY.
1910 IF KJ=1 THEN KJ=0 ELSE KJ=1
1920 GOTO 1940
1930 'OPTIONS
1940 TM=224:HL=24:VL=8:GOSUB930
1950 FOR X=0 TO 6:PRINT@257+(X*3
2),STRING$(22,32)::NEXT
1960 PRINT@259,"DESCENDING SPEED
"::IF DS=1 THEN POKE 1302,191
1970 PRINT@291,"ACCENDING SPEED"
:::IF IS=1 THEN POKE 1334,191
1980 PRINT@323,"DEC/ACC SPEED OF
F":
1990 PRINT@355,"TOG. RANDOM TONE
S"::IF RT=1 THEN POKE 1398,191
2000 PRINT@387,"TOGGLE KEY. & JO
Y.":
2010 PRINT@419,"DISPLAY LINE"::I
F DL=1 THEN POKE 1462,191
2020 PRINT@451,"COMMAND MENU":
2030 J1=25:J3=1281:X1=20:GOSUB 1
670
2040 ON L+1 GOTO 2050,2050,2150,
2130,1910,2160,160
2050 TM=397:HL=18:VL=3:GOSUB930
2060 PRINT@462,STRING$(16,32);
2070 PRINT@430,,:BV=PEEK(1470):I
NPUT"START SPEED":SS:POKE 1470,B
V
2080 PRINT@462,,:INPUT"END SPEED
":ES:POKE 1502,BV
2090 IF L=0 THEN DS=1:IS=0 ELSE
DS=0:IS=1
2100 FOR XX=0 TO 3:PRINT@398+(32
*XX),STRING$(17,32)::NEXT
2110 F=2
2120 GOTO 1940
2130 IF RT=1 THEN RT=0ELSE RT=1
2140 GOTO 1940
2150 DS=0:IS=0:F=0:GOTO 1940
2160 IF DL=1 THEN DL=0 ELSE DL=1
2170 GOTO 1940
2180 PRINT@355, " "
2190 PRINT@422,"WHAT DO YOU HEAR
"
2200 TM=389:HL=23:VL=3:GOSUB920
2210 CP=PEEK(1467)
2220 F=1:FOR P=1 TO K
2230 R=RND(43):IF R>9 AND R<16 T
HEN 2230
2240 N$=CHR$(R+48):GOSUB 560
2250 PRINT@439,,:INPUT I$
2260 IF N$<>I$ THEN 2310
2270 TM=243:HL=10:VL=3:GOSUB920
2280 PRINT@276,"CORRECT!";
2290 NR=NR+1
2300 GOTO 2350
2310 TM=240:HL=16:VL=5:GOSUB920
2320 PRINT@277,"SORRY";
2330 PRINT@305,"CHAR. SENT - "N$
";
2340 PRINT@337,"CHAR. RECD. - "I$
";
2350 EXEC 44539
2360 FOR X=0 TO 4:PRINT@218+(X*3
2),STRING$(15,32):POKE 1467,CP:N
EXT X,P
2370 TM=240:HL=14:VL=3:GOSUB920
2380 PRINT@273,"SCORE:"INT(100/K
*NR)"%"::EXEC 44539
2390 F=0:NR=0:GOTO 160

```

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*Keeping an eye on principal payments down the road*

# Mapping Your Finances

By David Macias

**W**hether you're trekking through the Himalayas or figuring your finances, it's important to know where you are and where you're going. Because figuring your finances is the less exciting of the two, you'll welcome knowing the CoCo can help with a program called *Amortize*.

The BASIC program, originally written by Ralph D. Miller, first appeared in the March '87 issue of THE RAINBOW (Page 82). The program calculates annual interest rates in percentage form, the number of interest periods annually (if your interest is compounded daily, this is 365; for interest compounded monthly, it is 12, etc.), number of payments per year, the amount of the loan in dollars, and the term of the loan in years. You enter digits only — no percent symbols or dollar signs are needed. The program checks your printer and notifies you if it is not online. If the printer is online, *Amortize* prints a header describing the loan and the computed installment amount. Then each payment is detailed by the amount of the payment applied to interest, the amount applied to principal, and the amount of debt outstanding. The tables are handy when you prepay principal payments in order to save interest. After printing the last payment, *Amortize* goes to the data input prompts to run another table.

*David is attending Cerritos College where he studies business computer systems. He works as a Computer operator in the data processing department and is a tutor for the music department in the MIDI lab. He is an advocate of the OS-9 operating system.*

The version included here has been rewritten to run in OS-9. A utility program by Burke & Burke makes the conversion,

but I wanted additional modifications to make use of windows and the added speed of a packed BASIC09 program.

## The listing: amortize

```

PROCEDURE Amortize
0000 (* ***** AMORTIZE *****
0039 (* by Ralph D. Miller - *****
0071 (* ***** - written in Basic09 *****
00AA (* ***** by David Macias *****
00E3 (* *****
011C (*
011F (* .....Variables
0136 (*
0139 (* ....JU = Interest
0140 (* .....O = Number of interest periods per year
017C (* .....S = Number of payments per year
01A3 (* .....A = Loan amount
01BA (* .....B = Period of loan in years
01DD (* .....D = Monthly interest
01F9 (* .....F = Single payment amount
021A (* ....IT = Total interest
0234 (*
0237 (* .....String Variables
0251 (*
0254 (* ...F$ = Single payment
026E (* ...HM$ = Interest on debt
028A (* ...RT$ = Payment on principle
02AA (* ...LF$ = Outstanding debt
02C6 (*
02C9 DIM Q,S,B,NP,PF,Y,WY:INTEGER
02E8 DIM CHAR:STRING[1]
02F4 DIM C1$,HM$,RT$,LF$,JF$,IG$,SP$:STRING[12]
0318 DIM A$,F$:STRING[12]
0328 DIM path,HC:BYTE
0333 path=1
033A HC=0
0341 CHAR=""
0348 10 REM *****
0358 REM Input data
0365 REM *****
0372 SHELL "display 0c"
0380 PRINT
0382 PRINT TAB(10); "Enter the annual interest rate in percent";
03B4 INPUT JU
03B9 IF JU=0 THEN 1000
03C9 M=JU/100
03D5 PRINT
03D7 PRINT TAB(10); "Enter the number of interest periods per year"
:
040D INPUT Q
0412 PRINT
0414 PRINT TAB(10); "Enter the number of payments per year";
0442 INPUT S
0447 PRINT
0449 PRINT TAB(10); "Enter the loan amount in dollars";
0472 INPUT A
0477 PRINT
0479 PRINT TAB(10); "Enter the period of the loan in years";

```

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All A-BUS Systems: ♦ Come assembled and tested ♦ Include detailed manuals with schematics and programming examples ♦ Can be used with almost any language (BASIC, Pascal, C, assembler, etc.) using simple "IN" and "OUT" commands (PEEK and POKE on some computers) ♦ Can grow to 25 cards (in any combination) per adapter ♦ Provide jumper selectable addressing on each card ♦ Require a single low cost unregulated 12V power supply ♦ Are usually shipped from stock. (Overnight service is available.)

## About Alpha Products

Founded in 1976 for the purpose of developing low cost I/O devices for personal computers. Alpha has grown to serve over 70000 customers in over 60 countries. A-BUS users include many of the Fortune 500 (IBM, Hewlett-Packard, Tandy, Bell Labs, GM...) as well as most major universities. A-BUS products are U.S. designed, U.S. built, and serviced worldwide. Overseas distributors: England: Cady Science Assoc. Ltd., Menseyside, 051 342 7033. Australia: Brumby Technologies Pty. Ltd., NSW, 759 1638. France: Coserm, Rungis, 46 86 64 75

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**Reed Relay Card:** 8 reed relays (20mA at 60VDC, SPST), individually controlled and latched, with status LEDs. **RE-156: \$109**

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**Digital Input:** 8 optically isolated inputs. Input can be 5 to 100V voltage levels or switch closures. **IN-141: \$65**

**Digital Output Driver:** 8 outputs: 250mA at 12V. Drive relays, solenoids, stepper motors, lamps, etc. **ST-143: \$78**

**Clock with Alarm:** Powerful clock/calendar. Battery backup. Timing to 1/100 sec. Alarm relay, LED and buzzer. **CL-144: \$98**

**Touch Tone Decoder:** Each tone is converted into a number which is stored on the board. **PH-145: \$87**

**A-BUS Prototyping card:** 4x4.5" card. Will accept up to 10 I.C.s. With power & ground bus. **PR-162: \$16**

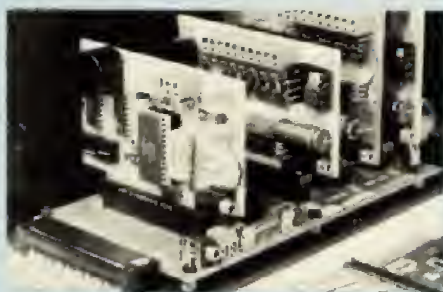
**Counter Timer:** Three 16 bit counters/timers. Use separately or cascade for long (48 bit) counts. **CT-150: \$132**

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## Motion Control

**Smart Quad Stepper Controller:** The world's finest.

On board microprocessor controls four motors simultaneously. Uses simple English commands like "MOVE ARM 10.2 (INCHES) LEFT". For each axis, you control coordinates (absolute or relative), ramping, speed, units, scale factors, etc. Many inputs for limit switches, etc. On the fly reporting of speed, position... Built in drivers for small motors (such as MO-103 or 105). **SC-149: \$299**  
Options: ▶ 5 amp/phase power booster for 1 motor: **PD-123: \$49**  
▶ Remote "teach" keypad for direct motor control: **RC-121: \$54**



A large A-BUS system with two Motherboards. Adapter in the foreground plugs into PC/XT/AT type slot.

**Stepper Driver Kit:** For experimenting with stepper motors. Includes 2 MO-103 motors and a ST-143 dual driver. **PA-181: \$99**

**Stepper Motors:** (4 phase, unipolar)

MO-103: 2 1/4" dia, 1/4" shaft, 7.5"/step, 12V, 5 oz-in torque. **\$15**

MO-104: 2" dia, 1/4" shaft, 1.8"/step, 5V, 60 oz-in torque. **\$45**

MO-105: 1.7" square, 2" shaft, 3.75"/step, 12V, 6 oz-in. **\$15**

## A-BUS Adapters

- ▶ Can address 64 ports and control up to 25 A-BUS cards.
- ▶ Require one cable. Motherboard required for more than 2 cards.

### A-BUS Parallel Adapters for:

IBM PC/XT/AT & compatibles. Use one short or long slot. **AR-133: \$69**

Apple II, II+, IIx Plugs into any slot inside. **AR-134: \$52**

Commodore 64, 128 Plugs into Expansion Port on back. **AR-139: \$48**

TRS-80 Model 102, 200 Uses 40 pin "System bus". **AR-136: \$76**

Model 100 (Tandy portable) Plugs into socket on bottom. **AR-135: \$75**

TRS-80 Model 3, 4, 4D Y-Cable available if 50 pin bus is used. **AR-132: \$54**

TRS-80 Model I Plugs into 40 pin expansion bus. **AR-131: \$39**

Tandy Color Computers Fits ROM slot, Multipack or Y-Cable. **AR-138: \$49**

**A-BUS Cable:** Necessary to connect any parallel adapter to one A-BUS card or to first motherboard. 50 pin, 3 ft. **CA-163: \$24**  
Special Cable for two A-BUS cards **CA-162: \$34**

**Serial Adapter:** Connect A-BUS systems to any RS-232 port. Allows up to 500 ft from computer to A-BUS. **SA-129: \$149**

**Serial Node:** To connect additional SA-129/A-BUS systems to a single RS232 serial port (max 16 nodes). **SN-128: \$49**

**Serial Processor:** same as above plus built in BASIC for off-line monitoring, logging, decision making, etc. **SP-127: \$189**  
Use SA-129 or SP-127 with modems for remote data acquisition.

**Motherboard:** Holds up to 5 A-BUS cards in sturdy aluminum frame with card guides. A sixth connector allows (using cables CA-161: \$12) additional Motherboards to be added. **MB-120: \$108**

**Power Supply:** Power pack for up to 4 cards. **PS-126: \$12**

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**ALPHA Products**

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This new version of *Amortize* includes an overlay window that prompts you to decide if you want a hard copy of the amortization table. You must have the /p driver in your boot, and the inkey and runb

modules must be in your CMDS directory in order for the program to work. If your table is a long one, use tmode -pause so the table does not scroll by you. In the print mode the program advances the paper every 40 lines.

(Questions or comments concerning this utility may be directed to the author at 11518 East Wimbley Court, Cevitos, CA 90701. Please enclose an SASE when requesting a reply.) □

```

04A7 INPUT B
04AC REM *****
04CE REM Calculate monthly interest rate
04F0 REM *****
0512 D=(1+M/Q)^(Q/S)-1
0530 REM *****
054C REM Calculate single payments
0568 RFM *****
0584 F=(1-(1+D)^(-S)*B)^-1*D*A
05AB C1=F
05B3 GOSUB 600
05B7 F$=C1$
05BF C1=A
05C7 GOSUB 600
05CB A$=C1$
05D3 SHELL "display 0c"
05E1 20 REM
05E7 PF=1
05EE GOSUB 710
05F2 DC=A
05FA WY=0
0601 REM *****
060E REM Start loop
061B REM *****
0629 310 FOR Y=WY+1 TO WY+10
0644 HM=DC*D
0650 CI=HM
0658 GOSUB 600
065C HMS=C1$
0664 RT=F-HM+.000325
0677 C1=RT
067F GOSUB 600
0683 RT$=C1$
068B LF=DC-RT
0697 C1=LF
069F GOSUB 600
06A3 LF$=C1$
06AB GOSUB 600
06AF C1=Y
06BB GOSUB 640
06BC TI=INT(100*HM+.5)/100
06D4 IT=IT+TI
06E0 PRINT #path USING "S14>".C1$,F$,HMS,RT$,LF$
0701 PF=PF+1
070C REM *****
0724 REM Check for end of page
073C REM *****
0754 IF PF>33 AND HC=1 THEN
0767 GOSUB 720
076B ENDIF
076D REM *****
0796 REM Is balance smaller then single payment
07BF REM *****
07E8 IF LF>=F THEN 530
07F8 REM *****
0810 REM Check for end of page
0828 REM *****
0840 IF PF>33 AND HC=1 THEN
0853 GOSUB 720
0857 ENDIF
0859 Y=Y+1
0864 REM *****
0876 REM Print last line
0888 REM *****
089A HM=LF+D
08A6 RT=LF-HM
08B2 C1=Y
08BB GOSUB 640
08BF PRINT #path USING "S14>".C1$,
08D1 CI=HM+LF
08DD GOSUB 600
08E1 GOSUB 700
08E5 PRINT #path USING "S14>".C1$,
08F7 IT=IT+INT(100*HM+.5)/100
0913 C1=HM
091B GOSUB 600
091F GOSUB 700
0923 PRINT #path USING "S14>".C1$,
0935 C1=LF
093D GOSUB 600
0941 GOSUB 700
0945 PRINT #path USING "S14>".C1$,

0957 PRINT #path USING "S14>","0.00"
096B C1=IT
0973 GOSUB 600
0977 GOSUB 700
097B PRINT #path
0981 PRINT #path," Total Interest paid ="
: C1$
TI=0
IT=0
REM *****
09CA REM Wait until key is pressed
09E6 REM *****
0A02 WHILE CHAR="" DO
0A1E RUN inkey(CHAR)
0A2A ENDWHILE
0A34 REM *****
0A38 REM Shift from printer to screen
0A57 REM *****
0A76 IF HC=1 THEN
0A95 PRINT #path
0AA1 ENDIF
0AA7 IF HC=1 THEN
0AB5 CLOSE #path
0ABB ENDIF
0ABD IF HC=1 THEN
0AC9 path=1
0AD0 ENDIF
0AD2 IF HC=1 THEN
0ADE HC=0
0AE5 ENDIF
0AE7 GOTO 750
0AEB 530 DC=LF
0AF6 NEXT Y
0B01 IF $*B>Y THEN 570
0B15 GOTO 310
0B19 570 WY=WY+10
0B27 GOTO 310
0B2B 600 REM *****
0B50 REM Round out to two decimal places
0B72 REM *****
0B94 C2=INT(100*C1+.5)/100
0BAC C1$="$"+STR$(C2)
0BB9 IF C2=INT(C2) THEN
0BC7 C1$=C1$+"00"
0BD4 ENDIF
0BD6 RETURN
0BD8 640 C1$=STR$(C1)
0BE4 RETURN
0BE6 REM *****
0BF0 REM Add zero if N*10^0=0
0C14 REM *****
0C2B 660 JF$=RIGHT$(F$,3)
0C39 IG$=LEFT$(JF$,1)
0C44 IF IG$<>"." THEN
0C51 F$=F$+"0"
0C5D ENDIF
0C5F RETURN
0C61 680 REM
0C67 JF$=RIGHT$(HMS,3)
0C72 IG$=LEFT$(JF$,1)
0C7D IF IG$<>"." THEN
0C8A HMS=HMS+"0"
0C96 ENDIF
0C98 JF$=RIGHT$(RT$,3)
0CA3 IG$=LEFT$(JF$,1)
0CAE IF IG$<>"." THEN
0CBB RT$=RT$+"0"
0CC7 ENDIF
0CC9 JF$=RIGHT$(LF$,3)
0CD4 IG$=LEFT$(JF$,1)
0CDF IF IG$<>"." THEN
0CEC LF$=LF$+"0"
0CF8 ENDIF
0CFA RETURN
0CFC 700 JF$=RIGHT$(C1$,3)
0D0A IG$=LEFT$(JF$,1)
0D15 IF IG$<>"." THEN
0D22 C1$=C1$+"0"
0D2E ENDIF
0D30 RETURN
0D32 REM *****
0D42 REM Print Heading

```

```

0052 REM *****
0062 710 PRINT #path,"The Amortization Table follows for a "; A$; " loan at "
      : JU:
00A0 PRINT #path," percent annually, "
00C5 PRINT #path,"for "; B; " years ("; S*B; " payments): "
00F8 PRINT #path
00FE GOSUB 660
0E02 REM print #path," Installment amount: ";F$
0E2A PRINT #path
0E30 PRINT #path USING "S14)"," Payment","Single ","Interest","Payment "
      ,"Outstanding"
0E77 PRINT #path USING "S14)"," Number ","Payment","On Debt ","On Princ "
      ,"Debt "
0E8E PRINT #path USING "S14)","-----","-----","-----"
      "-----"
0F00 RETURN
0F0A REM *****
0F21 REM Advance To Next Page
0F30 REM *****
0F4F 720 FOR NP=0 TO 25
0F62 PRINT #path
0F68 NEXT NP
0F73 GOSUB 710
0F77 PF=1
0F7E RETURN
0F80 REM *****
0F96 REM Open overlay window
0FAC REM *****
0FC2 750 SHELL "display 1b 3d 01"
0F09 SHELL "display 1b 22 01 C 8 30 B 02 00 00"
0FFF REM *****
1010 REM Choose options
1021 REM *****
1032 PRINT
1034 PRINT " Enter <1> for a hard copy"
1056 PRINT
1058 PRINT " Enter <2> for another calculation"
1082 PRINT
1084 PRINT " Enter <3> to quit"
109E PRINT
10A0 PRINT " ";
10A9 INPUT Z
10AE REM *****
10C5 REM Close overlay window
10DC REM *****
10F3 SHELL "display 1b 23"
1104 SHELL "display 1b 3d 00"
1118 ON Z GOTO 800,10,1000
112C REM *****
1143 REM Open path to printer
115A REM *****
1171 800 HC=1
117B path=2
1182 OPEN #path,"p":WRITE
118F GOTO 20
1193 REM *****
11A1 REM End program
11AF REM *****
118D 1000 SHELL "display 0c"
11CE END

```

## Corrections

**"Five-Column Directories"**(March 1989, Page 80): To prevent errors when listing multiple directories change THEN3ELSE in Line 10 to THENRUNELSE.

**"Key Ahead, Part II"**(August 1989, Page 14): In the command sequence on Page 18, change 12200 in the fourth line to 12300.

In Listing 2 on Page 20, change 179 in Line 260 to 79:

```

260 DATA 128,48,141,0,83,191,160
      ,218,191,247,129,191,165,105,134
      ,79,16,142

```

**"The Black Box"**(August 1989, Page 26): The listing on Page 28 in the second column has a smudge. Line 660 should read:

```
660 DRAW"BM80,184C2"+NUM$(MV)
```

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*Look, Dad! Look at what the postman just brought us — another two million dollars!*

Well, Johnny, not really. We're actually just the recipients of a never-ending bombardment of sweepstakes junk mail. In fact, our chances of winning are improbable.

*What does "improbable" mean?*

It means "probably not."

*Then we probably won't win the two million dollars?*

Right.

Why?

How would you explain the idea of probability to an inquisitive youngster? You could flip a coin, observing how many heads or tails occur in a set number of trials. Or you could use the three-cups-and-a-ball trick.

Children learn about this concept in elementary school. As they get older, the concept of probability is broadened using verbal math problems. Many of us continue to study, if not defy, the idea of probabilities well into our adult lives by betting on lotteries, card playing, bingo and other forms of gambling.

*Steve Blyn teaches both exceptional and gifted children, holds two master's degrees, and has won awards for the design of programs to aid the handicapped. He owns Computer Island and lives in Staten Island, New York.*

*Taking your chances . . .*

# Probability

**By Steve Blyn  
Rainbow Contributing Editor**

My program presents an exercise in becoming familiar with the laws of probability. It presents a wheel with 12 letters on it. The student is asked to determine the probability of a certain letter or combination of letters occurring on the next spin.

To add interest, some of the letters are red, some blue. This gives more flexibility to the questions. Sometimes the probability of one type of letter is asked for, and other times the probability of either of two types of letters is asked for.

Since there are 12 possible places for a spinner to land, each answer always begins in twelfths. The solution is reached by counting the correct occurrences and using that number as the numerator of a fraction with 12 as the denominator. As in other

math problems, fractions should be reduced to lowest terms. For example, the probability that at any hour the little hand of a clock will be at 3 is 1/12. The probability that it will be at 3 or 4 is 2/12, which is 1/6 after reduction.

Although this program could easily have been written in low resolution, I felt that a Hi-Res program is more effective for a program that relates to fractions. You therefore need to create or use Hi-Res letters and numbers. Lines 50 through 290 contain the strings to draw the letters and numbers needed in this program. The script letters are compliments of Joseph Kolar. Lines 300 through 370 draw the wheel. Lines 500 through 610 draw the letters within the wheel.

Lines 640 through 710 randomly select the question and tell the computer the correct answer, which is represented by Z\$. The student inputs his answer by pressing the letter preceding the correct answer on the screen. The program proceeds to the next question only after a correct response is given and is ended by pressing 9.

I have included a variety of sample questions; they are by no means the only possible questions that can be used for this particular letter wheel. You can study the program and modify it to ask other questions of your own design. If you are really adventurous, you can change the letters and questions to construct a follow-up program of your own. □

**The listing: PROBABLE**

```

10 REM"PROBABILITY"
20 REM "STEVE BLYN,COMPUTER ISLA
ND,STATEN ISLAND,NY,1989"
30 CLEAR1000:J=RND(-TIMER):PMODE
3,1:PCLS:SCREEN 1,1:COLOR 6
40 REM"STRINGS FOR LETTERS AND N
UMBERS BY J. KOLAR"
50 BB$="BRNR2HNGU3NHER2FGNL3FDGB
R2"
60 CC$="BU5F2M+3,-1HL2G2D2FR3NEB
R2"
70 DD$="BU4BRD4LURFR2EU3HL3GBD4B
R5"
80 FF$="BU2NF2NRBU2ER3NRGDNLNRD2
GBR3"
90 A$="RU2ERFDNFGLHBDBR4"
100 B$="RE2U3HGD4RFREUNLRBD2"
110 C$="RU2ERFBD2L2HBDBR3"
120 D$="RU2ERFDGLHBR3U4HGDFBDBFF
"
130 E$="RE2HGF2R"
140 F$="RE3UHGD6FEUHNLEBD"
150 H$="RE3UHGD3NDBEFDR"
160 L$="BRRE2U3HGD4FR"
170 N$="RENDUNUEFD2R"
180 O$="BEUERFDGLHBDBR4"
190 R$="REU2FRD2R"
200 S$="REU2F2GNHR2"
210 U$="RENU2FENU2F"
220 Q$="BU3BRUERFDGBDDBR2"? MAR
K
230 X$="BR5" 'SPACE
240 A1$="BU4BR2ED5BR2"
250 A2$="BU4ER2FDGL3D2R4BR2"
260 A3$="BU4ER2FGNL2FDGL2NHBR6"
270 A4$="BR3U5G3R4BD2BR3"
280 A5$="BU5NR4D2R3FDGNL3BR4"
290 A6$="BU5BRNR3GD3FR2EUHL2GBD2
BR7"
300 COLOR 8:CIRCLE(128,55),52:CO
LOR 6:CIRCLE(128,55),50
310 CIRCLE(128,55),6:PAINT(128,5
5),6,6
320 LINE(128,5)-(128,105),PSET
330 LINE(78,55)-(178,55),PSET
340 LINE(100,14)-(154,95),PSET
    
```



```

350 LINE(85,32)-(172,78),PSET
360 LINE(100,95)-(154,14),PSET
370 LINE(85,78)-(172,32),PSET
380 COLOR 7:LINE(0,133)-(255,135
),PSET,BF:COLOR 6
390 DRAW"S8BM30,155"+A1$+X$+X$+X
$+A1$+X$+X$+X$+A1$
400 DRAW+X$+X$+X$+A1$+X$+X$+X$+A
2$
410 DRAW"S8BM30,175"+A2$+X$+X$+X
$+A3$
420 DRAW"BM110,175"+A4$+X$+X$+X$
+A6$+X$+X$+A3$
430 DRAW"BM30,160:R8BR12R8BR12R8
BR12R8BR10R8"
440 DRAW"C7S4BM23,143"+A1$
450 DRAW"BM63,143"+A2$
460 DRAW"BM103,143"+A3$
470 DRAW"BM143,143"+A4$
480 DRAW"BM183,143"+A5$
490 REM"DRAW THE LETTERS"
500 DRAW"S8C6BM134,23"+BB$
510 DRAW"BM152,36"+FF$
520 DRAW"BM163,50"+DD$
530 DRAW"C8BM162,70"+BB$
540 DRAW"C6BM150,85"+BB$
550 DRAW"BM135,95"+BB$
560 DRAW"BM112,95"+CC$
570 DRAW"BM97,84"+BB$
580 DRAW"C8BM86,70"+FF$
590 DRAW"C6BM86,52"+DD$

```

```

600 DRAW"C8BM98,35"+BB$
610 DRAW"BM112,23"+DD$
620 COLOR 5:LINE(0,105)-(255,130
),PSET,BF:COLOR 6:X=RND(8)
630 DRAW"C6S8BM20,124"+CC$+H$+A$
+N$+C$+E$+S$+X$+O$+I$+X$+A$+X$
640 IF X=1 THEN Y$=BB$+X$+Q$:Z$=
"1"
650 IF X=2 THEN Y$=DD$+X$+Q$:Z$=
"3"
660 IF X=3 THEN Y$=FF$+X$+Q$:Z$=
"4"
670 IF X=4 THEN Y$=BB$+X$+O$+R$+
X$+FF$+X$+Q$:Z$="5"
680 IF X=5 THEN Y$=CC$+X$+O$+R$+
X$+DD$+X$+Q$:Z$="2"
690 IF X=6 THEN Y$=R$+E$+D$+X$+Q
$:Z$="2"
700 IF X=7 THEN Y$=R$+E$+D$+X$+B
B$+X$+Q$:Z$="4"
710 IF X=8 THEN Y$=B$+L$+U$+E$+X
$+Q$:Z$="5"
720 DRAW + Y$
730 EN$=INKEY$
740 IF EN$=Z$ THEN PLAY"03L32CDE
GFEDCEGFEDC":GOTO 620
750 IF EN$="" THEN 730
760 IF EN$="9" THEN 780
770 IF EN$<>Z$ THEN PLAY"02L20F#
F#":GOTO 730
780 CLS:END

```



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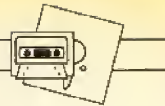
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*For snooping around inside your programs*

# PATCHWORK

## on the CoCo 3

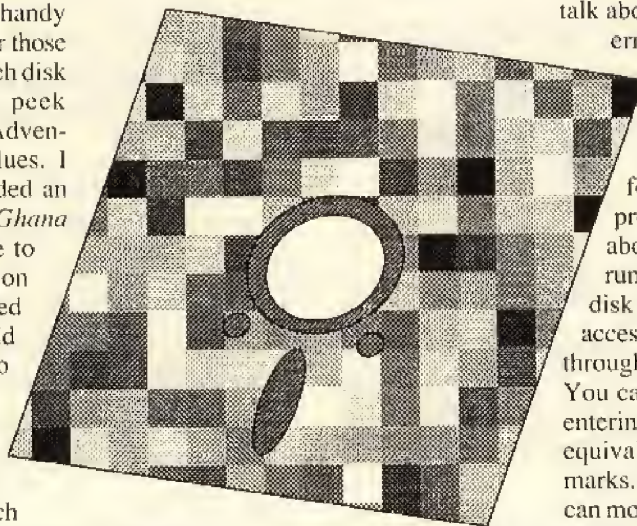
By Kirk Goodell

**D**isk Blaster is a handy little program for those who need to patch disk programs or peek around on an Adventures disk for commands and clues. I originally wrote it because I needed an easy way to patch *VIP Writer*, *Ghana Bwana*, *Trivia Fever* and the like to run on the CoCo 3. After hacking on my effort for a few days, I realized that with a little more work, I would have something good enough to share with fellow CoCoists.

During development I played with various screen formats but could not come up with one smaller than 80 columns upon which I could fit everything I wanted — not even the semi-supported 64-column screen. Those of you without decent monitors can modify the program to use a smaller, more readable screen and display a half-sector at a time.

The next thing I added in the development was the ability to search for a word in addition to just a byte, which made it a

*Kirk Goodell holds a bachelor's degree in computer science, and has been programming professionally for six years. He and his wife, Patty, and son, Justin, enjoy programming on their Color Computers and on their PC/IAT.*



lot easier to upgrade disks to CoCo 3 compatibility. This usually involves changing \$FF00 to \$FE00. Next I realized I needed direct disk I/O to access more than 35 tracks and non-standard sectors.

My last design decision involved the Sector Print option. I decided not to make the baud rate a menu item since I was rapidly running out of menu space. You must set up the baud rate for yourself just once before you run the program for the first time. (The best idea is to put the baud rate poke in the first line of the program.)

Enough about development — let's

talk about features. The program is fully error-trapped, including disk I/O.

Error messages are written on the status line (Line 24) of the screen. You can also access any OS-9 disks. (Hint: Try looking for the directory on Track 0.) The program searches an entire disk in about three minutes (the program runs at double speed except during disk I/O and printer output). You can access Drive 0 through 3, Track 0 through 39, and Sector 1 through 255. You can search for a byte or a word by entering the Hex value or the character equivalent(s) preceded by quotation marks. While examining a sector, you can modify any bytes in the sector and/or dump the sector to your printer. The program warns you if you make a change to a sector and try to leave it without first writing it back to the disk.

The Sector Print option is very useful for tracing a program on the disk. First dump the FAT (File Allocation Table), Track 17, Sector 2. Then dump the directory, Track 17, Sector 3, 4, etc. With this information on paper and the technical information chapter in your Disk BASIC manual, following a program on the disk is fairly easy.

Unfortunately along with features come limitations. The screen update is slow due to graphics-generated text and

the construction of the Hex values and printable character strings. A decent monitor is also needed in order to read the 80-column screen. (A CM-8 is a little fuzzy; a Magnavox 8CM 515 or an NEC Multisync looks super.) The best results are probably achieved with a monochrome monitor. Finally, you cannot change track numbers, sector numbers, CRCs or any other control bytes. This requires track I/O as opposed to sector I/O, and I have not figured out how to do this yet!

Although the program is menu-driven and self-explanatory, a few notes are in order. You can enter any sector from 1 to 255 for the Read option. However, the Find option defaults to 1 to 18 for each track scanned. For the Change option the byte number to be changed must be entered in Hex, but don't precede the number with &H. To enter the new value, you may enter the Hex value or the character having that value, preceded by either a single or double quotation mark. (If you want to change a byte to 41 Hex, you can enter 41, 'A or "A.") For the Find option you can search for a byte or a word; the value can be Hex or character as in the Change option. (To search for IJ, enter 494A, 'IJ or "IJ.")

This program is not designed to allow

you to crack or clone protected software, but it is one of my most useful utilities. At the very least, I have upgraded some stuff to work on the CoCo 3, and I have rediscovered my Adventures games!

(Questions or comments concerning this utility may be directed to the author at 805 College Hill Road, Apt. 76, Oxford, MS 38655. Please enclose an SASE when requesting a reply.) □

```

✓ 150 ... 234
  300 ... 161
  430 .. 100
  690 ..... 44
  880 .... 115
 1060 .. 188
 1280 .. 173
 1440 .... 55
  END ... 159
  
```

**The listing: BLASTER**

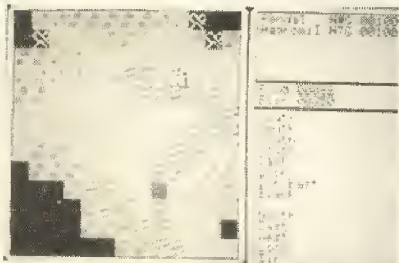
```

0 * COPYRIGHT 1989 FALSOFT, INC
10 ONERRGOTO1590:WIDTH80:CLS:CLE
AR1000;0$-STRING$(128," "):A$=ST
RING$(128," ") :DIMPC$(20):DR=0:T
R=0:SC=1:WG=0:DK=0:POKE&HFF9A,0
'BLACK BORDER
20 LOCATE21,1:PRINT"CAPTAIN KIR
K'S COCO3 DISK BLASTER":GOSUB
40:GOTO50
30 *UPDATE DRIVE, TRACK, SECTOR
HEADING
  
```

```

40 LOCATE21,3:PRINT"DRIVE ";DR;"
TRACK " : :PRINTUSING"##";TR;
:PRINT" SECTOR " : :PRINTUSIN
G"##";SC:RETURN
50 LOCATE0,22:PRINT"<D>RIVE <T
>RACK <S>ECTOR <R>EAD <W>RITE
<P>RINT <C>HANGE <F>IND <Q>
UIT";
60 LOCATE0,22
70 K$=INKEY$:IFK$="D"THENOP=1ELS
EIFK$="T"THENOP=2ELSEIFK$="S"THE
NOP=3ELSEIFK$="R"THENOP=4ELSEIFK
$="W"THENOP=5ELSEIFK$="P"THENOP=
6ELSEIFK$="C"THENOP=7ELSEIFK$="F
"THENOP=8ELSEIFK$="Q"THENOP=9ELS
E70
80 'OPTION: DRV,TRK,SEC,RED,WRT
,PRT,CHG,FND,QUIT
90 ONOP GOSUB120,170,220,280,410
,550,590,770,1610
100 GOTO60
110 'CHANGE DRIVE
120 GOSUB1010:IFWG THEN150
130 LOCATE28,3:K$=INKEY$:IFK$="0
"THEN0ELSEIFK$="1"THEN01ELSEI
FK$="2"THEN02ELSEIFK$="3"THEN0=
3ELSE130
140 IFD<>DR THENOK=0:DR=D:GOSUB4
0
  
```

**The Seventh Link**



This program is quite simply the best role-playing adventure the CoCo has ever seen. You must build a character who will adventure as your alter-ego through wild lands, battle fierce monsters, sail treacherous

seas, travel to other worlds and adventure through the dismal passages of Elira's many dungeons.

These dungeons are the visual highlight of the program. Presented in high speed 16-colour 3D, and full of monsters, ladders, pits and water, flooded rooms and doors, chests and healing fonts, they will keep you wandering and wondering for many fascinating hours.

Of course, you will need to arm and provision yourself first, and perhaps find friends to accompany you within the many castles you will find amongst the islands of Elira.

The package includes three discs, a 30-page manual, 4 maps, a quick reference card and a strip of simulated superconductor wire.

**Price: \$38 US/ \$48 Cdn**

Requires: 128K CoCo3, 1-40 track drive (Your RS drive is capable of 40 tracks if it's not an old grey one.)



**Version 1.2 Features: Extra monster, faster boot-up, faster dungeon movement, and better outside graphics!**

Hint Book (20 pgs. dngr/town maps, clues etc.):\$5.50. Books for Caladuril 1 or 2 (Specify): \$3.50. Books, add \$1 S/H each.

**Studio Works**

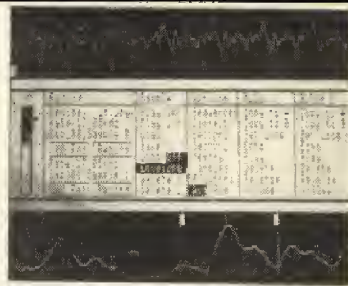
At last, here is the digital audio sampler that delivers what other systems promise. It features full point and click operation, on-screen graphical display and editing of TWO samples at once, using two available audio clipboards and a host of editing/manipulation features.

An audio signal is digitized through an adaptor cable (comes with package, or you may use the Maxsound cable), which plugs into your joystick port. Once the sound has been recorded into CoCo's memory, you can alter it and play it back, record it on disc and include it in your own BASIC or ML programs. Features include: reverse, delete, copy, volume control, play-block, sequencer, envelope draw, 56 samples in memory (512k only, 8 on 128k), play any from keyboard (great for adding special effects to home movies), playthrough, looping, file compression, 5.19-17.05 kHz record rate, (512k: 10-88 seconds, 128k:1.5-12 seconds), BASIC driver program, and more.

With cable: \$54US/\$64Cdn. without:\$39US/\$49Cdn.

**NEW! Sound Effects Packs. Load a few samples into Studio Works, add them to movies or answering machine messages, or anything! \$14 Each.**

FX1: General (4 discs, 12 Samples) includes: Breaking glass, car starting, creaky door, applause, etc.  
FX2: Animals (3 discs, 11 Samples), Dogs barking, monkeys, frogs, chickens, etc.



(Req: CoCo3, drive, mouse or joystick)

**Caladuril 2: Weatherstone's End**

Monstrous storms threaten the Valley and young Prince Olin is sent to secure help from the powers that remain on Lord's Isle.

His ship is wrecked and he finds himself cast ashore on a land that is held in the grip of the enemy. Prompted by the success of the highly acclaimed Caladuril Flame of Light, this program was entirely rewritten to take advantage of the CoCo 3's speed, graphics and memory to create one of the most impressive adventures to be found on the CoCo. Caladuril 2 recognizes over 70 verbs and contains in excess of 180 defined objects. The game is played in an unstructured world which you explore by scrolling your character around on a graphic window. When you approach an object, its name is printed on-screen, and you may manipulate it using multi-word English commands such as "GET THE KEY WITH THE LONG HOOK THEN UNLOCK THE DOOR".

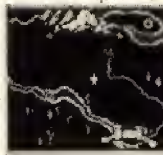
The package includes: a 20 page manual, 11X17" map, velvet pouch of Powerstones and 3 discs.

**Price: \$32 US/ \$38 Cdn**

Requires: 128K CoCo3, 1 drive

Also available: Caladuril, Flame of Light (64K CoCo 1/2/3, drive \$18/\$24), reviewed in The Rainbow, December 87

See review, Rainbow June 89, page 120.



Caladuril II: Weatherstone's End By Jeff Hoyle and Dale Triggerson Being the second part of the adventures of the house of Tark, Lord of Fire

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```

150 RETURN
160 'CHANGE TRACK
170 GOSUB1010:IFWG THEN200
180 LOCATE41,3:INPUTT:IF(T<0)OR(
T>39)THENLOCATE41,3:PRINT " ";;
GOTO180
190 IFT<>TR THENOK=0:TR=T:GOSUB4
0
200 RETURN
210 'CHANGE SECTOR
220 GOSUB1010:IFWG THEN260
230 LOCATE56,3:INPUTS:IF(S<1)OR(
S>255)THENLOCATE56,3:PRINT " ";;
:GOTO230
240 IFS<>SC THENNOK=0:SC=S
250 GOSUB40
260 RETURN
270 'READ SECTOR
280 GOSUB1010:IFWG THEN320
290 LOCATE30,22:DP=256*PEEK(&HC0
06)+PEEK(&HC007):POKEDP,2:POKEDP
+1,DR:POKEDP+2,TR:POKEDP+3,SC:AA
=VARPTR(A$):POKEDP+4,PEEK(AA+2):
POKEDP+5,PEEK(AA+3):POKE65496,0:
EXEC256*PEEK(&HC004)+PEEK(&HC005
):POKE65497,0:ER=PEEK(DP+6):IFER
=0THEN310
300 LOCATE2,23:PRINT"*** DISK RE
AD ERROR -- ";;GOSUB450
310 IFOP=4THENGOSUB340
320 RETURN
330 'DISPLAY SECTOR CONTENTS
340 ROW=5:LOCATE0,5:OK=-1:FORSM=
1T02:IFSN=1THENS$=A$ELSES$=B$
350 B=1:FORLP=1T08:BS=(SN-1)*128
+B-1:PRINT " ";;IFBS<16THENPRINT
"0";
360 PRINTHEX$(BS)::PRINT": ";;F
ORBY=B T015+B:PRINT " ";;BV=ASC(M
ID$(S$,BY,1)):IFBV<16THENPRINT"0
";
370 PRINTHEX$(BV)::IFINT(BY/4)*4
=BY THENPRINT" ";;
380 IFINT(BY/8)*8=BY THENPRINT"
";
390 NEXT:PRINT" ";;PC$(ROW)=""::F
ORBY=B T015+B:CD=ASC(MID$(S$,BY,
1)):GOSUB710:PC$(ROW)=PC$(ROW)+C
HR$(CD):NEXT:PRINTPC$(ROW):ROW=R
OW+1:B=B+16:NEXTLP:NEXTSN:RETURN
400 'WRITE SECTOR
410 LOCATE38,22:DP=256*PEEK(&HC0
06)+PEEK(&HC007):POKEDP,3:POKEDP
+1,DR:POKEDP+2,TR:POKEDP+3,SC:AA
=VARPTR(A$):POKEDP+4,PEEK(AA+2):
POKEDP+5,PEEK(AA+3):POKE65496,0:
EXEC256*PEEK(&HC004)+PEEK(&HC005
):POKE65497,0:ER=PEEK(DP+6):IFER
=0THENWG=0:GOTO430
420 LOCATE2,23:PRINT"*** DISK WR
ITE ERROR -- ";;GOSUB450
430 RETURN
440 'DISPLAY DISK ERROR
450 IFER=4THENPRINT"LOST DATA":
460 IFER=8THENPRINT"CRC ERROR":
470 IFER=16THENPRINT"SEEK ERROR/
SECTOR NOT FOUND":
480 IFER=32THENPRINT"WRITE FAULT
";
490 IFER=64THENPRINT"WRITE PROTE
CT":
500 IFER=128THENPRINT"DRIVE NOT
READY":
510 IF(ER<>4)AND(ER<>8)AND(ER<>1

```

```

6)AND(ER<>32)AND(ER<>64)AND(ER<>
128)THENPRINT"MULTIPLE ERRORS!";
520 PRINT -- PRESS <ENTER> ****
;;SOUND150,5
530 IFINKEY$<>CHR$(13)THEN530ELS
ELOCATE2,23:PRINTSTRING$(77," ")
;;RETURN
540 'PRINT SECTOR
550 LOCATE30,23:ATTR0,0,B:PRINT"
*** PRINTING ***";ATTR0,0:POKE6
5496,0:R=0:FORI=442848T0445728ST
EP2:A=LPEEK(I):R=R+1:A=A AND127:
IFA>95THENA=A-64
560 PRINT#-2,CHR$(A)::IFR>79THEN
PRINT#-2:R=0
570 NEXT:PRINT#-2:POKE65497,0:LO
CATE30,23:PRINT"
";RETURN
580 'CHANGE BYTE
590 IFNOTOK THEN700ELSELOCATE64,
22:PRINT"BYTE # ";;PRINTCHR$(8);
:GOSUB1120 'GO ACCEPT A HEX VALU
E
600 IF(DV<0)OR(DV>255)THEN690
610 NB=DV:IFNB<128THENV=ASC(MID
$(A$,NB+1,1))ELSEVA=ASC(MID$(B$,
NB-127,1)) 'SAVE ORIG VALUF IN C
ASE OF CHANGE-ABORT
620 ATTR0,0,B:GOSUB1050
630 LOCATE64,22:PRINT"TO ";;
:LOCATE67,22:GOSUB1120 'GO ACCEP
T A HEX VALUE
640 IF(DV<0)OR(DV>255)THEN680ELS
EVA=DV:WG=-1
650 IFNB>127THEN670
660 MID$(A$,NB+1,1)=CHR$(VA):GOT
0680
670 MID$(B$,NB-127,1)=CHR$(VA)
680 GOSUB1050
690 LOCATE64,22:PRINT" <F>IND";
700 RETURN
710 'IF CD IS NOT A PRINTABLE CH
ARACTER, REPLACE IT WITH A PERIO
D
720 IFCD<32THENC0=46
730 IF(CD>90)AND(CD<96)THENC0=46
740 IFCD<127THENC0=46
750 RETURN
760 'FIND A BYTE OR WORD
770 GOSUB1010:IFWG THEN990
780 LOCATE55,22:PRINT"FIND VALUE
":LOCATE66,22:GOSUB1300
790 IFWD$=""THEN980
800 GT=TR:GS=SC
810 LOCATE55,22:PRINT"START TRAC
K":LOCATE67,22:INPUTST:IF(ST<0)O
R(ST>34)THEN810
820 LOCATE55,22:PRINT"START SECT
OR":LOCATE67,22:INPUTSS:IF(SS<1)
OR(SS>18)THEN820
830 LOCATE55,22:PRINT"END TRACK
":LOCATE67,22:INPUTET:IF(ET<0)O
R(ET>34)OR(ET<ST)THEN830
840 LOCATE55,22:PRINT"END SECTO
R":LOCATE67,22:INPUTES:IF(ES<1)O
R(ES>18)OR((ST=ET)AND(ES<SS))THE
N840
850 LOCATE55,22:PRINT"S E A R C
H I N G";FORTR=ST TOET:FORSC=SS
TOES:GOSUB40:GOSUB280:PA=INSTR(
1,A$,WD$):PB=INSTR(1,B$,WD$):PC=
0:IF(LEN(WD$)-2)AND(RIGHT$(A$,1)
=LEFT$(WD$,1))AND(LEFT$(B$,1)=RI
GHT$(WD$,1))THENPC=1

```

```

860 IF(PA=0)AND(PB=0)AND(PC=0)TH
EN960ELSEGT=TR:GS=SC:GOSUB340
870 IFPA=0THEN900ELSEIX=0
880 NB=PA-1:VA=ASC(LEFT$(WD$,1))
:ATTR0,0,B:GOSUB1050:IFLEN(WD$)=
2THENN=NB+1:VA=ASC(RIGHT$(WD$,1
)):ATTR0,0,B:GOSUB1050
890 IX=PA+LEN(WD$):PA=INSTR(IX,A
$,WD$):IFPA>0THEN880
900 QC=0:IFPC=0THEN910ELSEQC=1:N
B=127:VA=ASC(LEFT$(WD$,1)):ATTR0
,0,B:GOSUB1050:IFLEN(WD$)=2THENN
B=NB+1:VA=ASC(RIGHT$(WD$,1)):ATT
R0,0,B:GOSUB1050
910 IFPB=0THEN940ELSEIX=0
920 NB=127+PB:VA=ASC(LEFT$(WD$,1
)):ATTR0,0,B:GOSUB1050:IFLEN(WD$
)=2THENN=NB+1:VA=ASC(RIGHT$(WD$
,1)):ATTR0,0,B:GOSUB1050
930 IX=PB+LEN(WD$):PB=INSTR(IX,B
$,WD$):IFPB>0THEN920
940 LOCATE55,22:PRINT"CONTINUE S
EARCH ?";
950 K$=INKEY$:IFK$=""THEN950ELSE
IFK$="N"THEN970ELSELOCATE55,22:P
RINT"S E A R C H I N G";
960 NFXTC,TR
970 TR=GT:SC=GS:GOSUB30
980 LOCATE55,22:PRINT"<C>HANGE
<F>IND <Q>UIT"
990 RETURN
1000 'WARN USER IF SECTOR CHANGE
MADE BUT NOT WRITTEN
1010 IFWG THENLOCATE8,23:PRINT"
** WARNING -- SECTOR CHANGE BUFF
ER NOT WRITTEN -- OKAY ? ";;SOUN
D150,5ELSE1030
1020 K$=INKEY$:IFK$=""THEN1020CL
SELOCATE8,23:PRINTSTRING$(70," "
);;IFK$="Y"THENWG=0
1030 RETURN
1040 'LOCATE THE VALUE AND PRINT
-CHARACTER OF A BYTE AND REFRESH
THEM
1050 ROW=5:TB=NB
1060 IFTB>15THENTB=TB-16:ROW=ROW
+1:GOTO1060
1070 COL=TB*3+8:IFTB>3THENCOL=CO
L+1:IFTB>7THENCOL=COL+2:IFTB>11T
HENCOL=COL+1
1080 LOCATECOL,ROW:IFVA<16THENPR
INT"0";
1090 PRINTHEX$(VA);;CD=VA:GOSUB7
10:LOCATE62+TB,ROW:PRINTCHR$(CD)
;;ATTR0,0:LOCATE63+TB,ROW:PRINTR
IGHT$(PC$(ROW),15-TB)
1100 RETURN
1110 'HEX NUMBER ENTRY FROM 00 T
O FF. ERROR TRAP AND RETURN DEC
IMAL VALUE IN DV. USES XX, H
N$, AND LN$ LOCALLY AS SCRATCH V
ARIABLES.
1120 K$=INKEY$:IFK$=""THEN1120
1130 IFK$=CHR$(13)THENDV=999:GOT
01280 'SIGNAL CALLING CODE TO AB
ORT
1140 PRINTK$;;HN$=K$
1150 K$=INKEY$:IFK$=""THEN1150
1160 IFK$=CHR$(13)THENLN$=HN$:HN
$="0":PRINT " ";;GOTO1220
1170 PRINTK$;;IFK$=CHR$(8)THEN11
20
1180 LN$=K$
1190 K$=INKEY$:IFK$=""THEN1190

```

```

1200 IFK$=CHR$(8)THENPRINTK$;:GO
TO1150
1210 IFK$<>CHR$(13)THEN1190
1220 IF(HN$="")OR(HN$=CHR$(34))
THENDV=ASC(LN$):GOTO1280
1230 DV=ASC(HN$)-48:IFDV>9THENDV
=DV-7
1240 IF(DV<0)OR(DV>15)THENPRINTC
HR$(8);CHR$(8);:GOTO1120
1250 DV=DV*16:XX=ASC(LN$)-48:IFX
X>9THENXX=XX-7
1260 IF(XX<0)OR(XX>15)THENPRINTC
HR$(8);CHR$(8);:GOTO1120
1270 DV=DV+XX
1280 RETURN
1290 'HEX STRING ENTRY FROM 0 TO
FFFF
1300 WD$(1)="":WD$(2)="":WD$(3)=
"":WD$(4)="":I=0
1310 I=I+1
1320 K$=INKEY$:IFK$=""THEN1320EL
SEIFK$=CHR$(13)THENNC=I-1:GOTO13
30ELSEPRINTK$;:IFK$=CHR$(8)THENI
=I-1:GOTO1320ELSEWD$(I)=K$:IFI<4
THEN1310ELSENC=4
1330 IF(WD$(1)<>"")AND(WD$(1)<>
CHR$(34))THEN1370
1340 IFNC=3THENWD$=WD$(2)+WD$(3)
:GOTO1570
1350 IFNC=2THENWD$=WD$(2):GOTO15
70
1360 VD=0:GOTO1380
1370 VD=-1:FORI=1TONC:IFINSTR(1,
"0123456789ABCDEF",WD$(I))=0THEN

```

```

VD=0:NEXTELSENEXT
1380 IFNOTVD THENFORI=1TONC:PRIN
TCHR$(8);:NEXT:GOTO1300
1390 IFNC=0THENWDS="":GOTO1570
1400 ONNC GOTO1410,1430,1460,150
0
1410 HB$="":XX=ASC(WD$(1))-48:IF
X X > 9 T H E N X X = X X - 7 1 4 2 0
LB$=CHR$(XX):GOTO1560
1430 HB$="":XX=ASC(WD$(1))-48:IF
XX>9THENXX=XX-7
1440 XY=ASC(WD$(2))-48:IFXY>9THE
NXY=XY-7
1450 LB$=CHR$(XX*16+XY):GOTO1560
1460 XX=ASC(WD$(1))-48:IFXX>9THE
NHB$=CHR$(XX-7)ELSEHB$=CHR$(XX)
1470 XX=ASC(WD$(2))-48:IFXX>9THE
NXX=XX-7
1480 XY=ASC(WD$(3))-48:IFXY>9THE
NXY=XY-7
1490 LB$=CHR$(XX*16+XY):GOTO1560
1500 XX=ASC(WD$(1))-48:IFXX>9THE
NXX=XX-7
1510 XY=ASC(WD$(2))-48:IFXY>9THE
NXY=XY-7
1520 HB$=CHR$(XX*16+XY)

```

```

1530 XX=ASC(WD$(3))-48:IFXX>9THE
NXX=XX-7
1540 XY=ASC(WD$(4))-48:IFXY>9THE
NXY=XY-7
1550 LB$=CHR$(XX*16+XY)
1560 WDS=HB$+LB$
1570 RETURN
1580 'ERROR
1590 LOCATE0,10:PRINT:PRINT"
PROGRAM
ERROR":PRINT:END
1600 'QUIT
1610 GOSUB1010:IFWG THENRETURNEL
SEPOKE65496,0:END

```



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## Simple Upgrade?

*Can I upgrade a 300-baud modem to 1200 baud by some simple means, such as installing a different crystal? Can you recommend any shareware OS-9 terminal programs?*

*Kerry Whitemore  
Medicine Hat, Alberta*

There is no way to upgrade a 300-baud modem because the circuitry for all aspects of a 1200-baud modem is completely different from that of a 300-baud modem. The only upgrade is to throw out the 300-baud modem and buy a 1200-baud one.

In Delphi's OS-9 SIG Telcom section are a number of newer programs that have the look and feel of *Procomm*, the most popular IBM shareware terminal program. These include *Telstar* and *Iterm*.

*XCom9* (be sure to get the version for the CoCo 3), also available on Delphi, is an older OS-9 terminal program that is tried and true. With some of these programs you must be careful that all of the terminal program is on disk in your CMDS directory in order for the program to work. You must have the t2 or actapak driver in memory and be sure the RS-232 pack is in the correct slot of the Multi-Pak (in most cases this will be Slot 1), unless you are using a Y cable or have strapped the \*CART pins of your Multi-Pak.

## Poking Lowercase Out of CoCo

*How can I force the 32-column CoCo 3 screen to display lowercase letters using pokes?*

*Bill Jackson,  
Sacramento, California*

I just checked with Art Flexser, a master of BASIC on the CoCo 3, and he informs me that you should use POKE &H95C9, &H57:POKE &HFF22, &H50 to get lowercase with a green border and substitute &H17 and &H10 for the



## By Marty Goodman Rainbow Contributing Editor

&H7 and &H50, respectively, if you want a black border.

## Screen Sparklies

*Can you tell me how to fix the "sparklie" problem—those bits of snow I get on my screen during disk I/O under OS-9? How can I get a spare GIME chip and how much does it cost?*

*Jeff Beer  
Canto, Massachusetts*

I provided details of Roger Krupski's sparklie fix in the October '88 issue of THE RAINBOW, Page 58. As Kevin Darling pointed out, the sparklie problem seems to be worst when the computer and its chips are hot. Sometimes reflowing the solder joints (heating and allowing the solder to remelt) for the GIME chip socket helps a sparklie-plagued CoCo 3. Sometimes the problem can be fixed by replacing an older 1986 GIME chip with the newer 1987 version. New GIME chips can be ordered directly or through your local Radio Shack store from National Parts. The RS part number for the current GIME chip is MX-0992, and its description is "VC2838 Custom Controller Chip, Replacement for VC2465." Be sure to also specify that it is a part for the CoCo 3 (Cat. No. 26-3334).

## Floppy Drive Burnout

*I have a burned-out FD-500 floppy drive power supply and have been told that the*

*supply has intrinsic problems. Can you recommend an alternative power supply?*

*George Quellhorst  
Plainesville, Ohio*

Jameco (call 415-592-8097), of Belmont, California, sells some excellent power supplies for that purpose. In particular, its PS72C, priced at \$24.95, is a rugged bench linear power supply delivering regulated 12V at 6 amps and 5 volts at 2 amps. This should be enough for two floppy or hard drives. Alternatively if you are a determined do-it-yourselfer, look in Delphi's CoCo SIG Hardware Hacking section. There you'll find a schematic diagram for an excellent 12- and 5-volt power supply that Don Hutchison and I devised. With commercial surplus supplies available in the \$20 to \$40 price range, it seems silly to bother making one unless you have a well-stocked parts bin and lots of time on your hands.

## Overheated in Dallas

*I have a CoCo 2 whose power supply seems to be overheating. What can I do about it?*

*Norman Grubb  
Dallas*

Fixing an overheating CoCo power supply takes experience with electronics and some common sense. One thing that some have done with success is to replace the regulating NPN power transistor with a 2N3022 generic power transistor. Mount it on a fat, finned heat sink (instead of the wimpy heat sink provided by Tandy). Alternatively you can provide your own source of regulated +5 volts (capable of delivering 1.5 amps) and unregulated +10 and -10 volts (at 100 mA or so). To disconnect the existing power supply and hook up an external one, a schematic diagram for the exact model of CoCo you have is a must. Get the service manual for that CoCo catalog number from National Parts. Be sure when feeding in power from an external supply to remove the big filter capacitor in the CoCo itself and replace it with a small (50  $\mu$ F) one, or you risk ground loop current problems.

## Strange Connector

*What is involved in using one of those Tandy 1000EX external add-on drives with a Color Computer? It uses a funny 30-pin connector on its cable.*

*Dick Reitz  
New Jersey*

*Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator—sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW's CoCo SIG and database manager of OS-9 Online. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.*

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The drives and cases with those Tandy external drive systems are excellent generic items that can be used with the CoCo and other computers. However, the 30-wire cable that comes out of them is ultra-weird and very specific to the Tandy 1000 computer system. The cases have no power supply in them, and power is supplied to the drive via some of the lines on that 30-wire cable. The data and ground lines for the drive are in totally different places on the cable than they are in normal 34-wire drive cables. My recommendation, if you have such a drive and want to use it with the CoCo, is to open up the case and remove the Tandy special cable, then use your own normal 34-wire cable and add a power supply of your choosing to the system. Paul Tesch (PAUL.TESCH) told me he checked the 30-wire cable using an ohmmeter, and got the results shown in Table 1.

| <b>Table 1:</b>     |                              |                     |                              |
|---------------------|------------------------------|---------------------|------------------------------|
| Tandy 30-wire cable | normal 34-pin cable or power | Tandy 30-wire cable | normal 34-pin cable or power |
| 1                   | +12V                         | 2                   | +5V                          |
| 3                   | +12V                         | 4                   | +5V                          |
| 5                   | GND                          | 6                   | +5V                          |
| 7                   | GND                          | 8                   | +5V                          |
| 9                   | GND                          | 10                  | Pin 8                        |
| 11                  | GND                          | 12                  | Pin 26                       |
| 13                  | GND                          | 14                  | Pin 20                       |
| 15                  | Pin 32                       | 16                  | Pin 16                       |
| 17                  | Pin 18                       | 18                  | GND                          |
| 19                  | Pin 28                       | 20                  | GND                          |
| 21                  | Pin 30                       | 22                  | GND                          |
| 23                  | Pin 22                       | 24                  | GND                          |
| 25                  | Pin 24                       | 26                  | GND                          |
| 27                  | Pin 10                       | 28                  | +12V                         |
| 29                  | 12                           | 30                  | +12V                         |

### Intermingling Printer

*How do I hook up to the CoCo a printer designed to be hooked to a Commodore 64's serial port?*

*Will Brunner  
Brooksville, Florida*

Unless you are familiar with some of the fundamentals of electronic tinkering, it is probably not worth your effort to try, given how inexpensive printers are these days. The Commodore 64's serial port puts out serial data in a manner similar to that of "normal" RS-232 ports *but* not at the same voltage levels. Where normal RS-232 ports send data at levels of +5 to +12 volts for high and -5 to -12 volts for low, the Commodore 64 sends the data out at TTL levels: +5 volts for high, 0 volts for low. Given a schematic or technical specs for the printer in question, you should be able to add level converter chips (either the 1488 and 1489 pair sold by Tandy if you can add + and - 12 volt power supplies for them, or a MAX232 chip that runs directly off a single +5 volt supply and generates internally its own voltages for level conversion) and convert the printer for use with a normal RS-232 port. But as I mentioned, this requires some experience.

### Intermingling Drives

*How can I use the FD-502 or other double-sided disk drive as a double-sided drive under Radio Shack's Disk Extended BASIC?*

*Chris Tracy  
Mt. Pulaski, Illinois*

Your best bet by far is to purchase ADOS-3 or a similar alternate DOS from any of a number of Color Computer vendors (such as Microcom). ADOS-3, produced by Art Flexser of SpectroSystems in Miami, Florida, allows using both sides of double-sided drives and adds many other fixes and features to Disk BASIC while retaining a high level of compatibility with Disk BASIC-based software. You can also get help and advice about this product directly from Art himself via Delphi's Color Computer Special Interest Group, where Art appears almost daily.

### Echoing Printer

*Is there a command under RS BASIC for the CoCo 3 that is equivalent to the DUAL command on a Model 3, which causes the printer to echo what is printed to the screen?*

*Chuck Carpinello  
Rensselaer, New York*

No, there is no such command within RS BASIC. But it is fairly simple to write a two- or three-line program that, under BASIC, dumps the contents of the text screen to the printer. Naturally you need to set your CoCo and printer's baud rates to be the same. You need a printer that has a serial input or one to which a serial-to-parallel converter has been added. The Model 3 talks to printers with parallel inputs, whereas the CoCo sends data to the printer over an RS-232 serial line.

### Need Help in Independence

*Can you help me use Color Scribes on*

*my CoCo 1 to select different fonts on my DMP-106 printer?*

*Paul Kemp  
Independence, Missouri*

It is not worth trying to do anything with *Color Scribes*, in my opinion, when there are so many other far better, more flexible word processors available for the CoCo (all models) for relatively modest prices. For the CoCo 1 I recommend *TeleWriter 64* or *VIP Writer* (I find the former easier to learn, though many of my friends swear by the latter). Both these programs offer the ability to change printer fonts and support underline, boldface and most other features that any given printer offers.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P. O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

Questions can also be sent to Marty through the Delphi CoCo SIG. From the CoCo SIG> prompt, pick Rainbow Magazine Services, then , at the RAINBOW> prompt , type ASK (for Ask the Experts) to arrive at the EXPERTS> prompt , where you can select the "CoCo Consultations" on line form which has complete instructions.



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## My Squinting Sister

Currently I own two word processors, Telewriter-64 and T/S Edit. While I have no trouble using Telewriter-64, my sister, who frequently has the need to use a word processor, has trouble seeing the words and letters on TW-64.

T/S Edit provides a solution to her problem — even though the Disk BASIC version does not allow text formatting in any way. So to format the text, we use TW-64, which — when used to read files created by T/S Edit — presents some trouble. Even though TW-64 can read ASCII files, it frequently leaves out a big chunk of text when reading ASCII files created by T/S Edit. This situation causes both of us lots of aggravation.

I am aware there's a text formatter for T/S Edit called T/S Word. This program requires OS-9 to run, the very idea of which is outrageous to my sister. She dislikes its complexity and avoids it at all costs. What's more, the cursor in T/S Edit's OS-9 version for some unknown reason does not blink, making it hard to use and follow on the screen. Can you offer some assistance?

Hinh Phansavath  
Buena Park, California

With a CoCo3 you can upgrade from Telewriter-64 to Telewriter-128, which satisfies both formatting requirements and provides readable text using the CoCo 3's native 80-by-24 display. If cost is a constraint, a relatively inexpensive composite video monochrome monitor works fine for word processing.

## CoCo Possessed

Two weeks ago I received my Color Computer 3. My current system also includes dual disk drives with a Disto Super Controller, a 13-inch color TV and an NX-1000 Rainbow printer with a Blue Streak interface.

My problem started a couple of days ago when I met with two other Color Computer nuts over here in Germany. One

---

Richard Esposito is the principal engineer for BDM Corporation. He holds bachelor's, master's and doctorate degrees from Polytechnic Institute of Brooklyn. He has been writing about microcomputers since 1980.

Richard Libra is a simulator test operator for Singer Link Simulation Systems Division.



By Richard E. Esposito  
Rainbow Contributing Editor  
with Richard W. Libra

of them has a CoCo 2 with ADOS and the other a CoCo 3 with ADOS 3. I have RS-DOS 1.1 installed in my controller and can run almost all of my programs just fine. But when I try to run their programs, the frustration begins.

I can only run about 10 percent of their programs. When I try to run the other 90 percent, the program freezes just after the beginning — or I receive OM, DS, OS, AO, or FC errors, just to name a few. I also get spiking lines that run horizontally across the screen while the picture is frozen. Sometimes the screen comes up with what I call "looking at the inside of a bee hive." It's the kind of screen you get when you try to run a CoCo 3 program on a CoCo 2. If this is not enough, sometimes the disk drive keeps running and running, at times without the little red light on. Or Drive 1 starts running when only Drive 0 contains a disk.

I also can see the picture of the Three Magi in the background of some of my programs. Is this because RS-DOS does not like ADOS-saved programs, or do I need to upgrade my current RS-DOS 1.1 ROM chip in my controller? If I have to upgrade to a different DOS, which one do I go to: ADOS, CDOS or MJK DOS? My Disto Super Controller has three more 28-pin sockets in which I can put a total of four

DOS EPROM chips. From an economic standpoint, I think I should look at the most compatible DOS — or is there another problem that prohibits me from running these ADOS-saved programs?

Two more quick questions: What is the F2 key for? And which is most advisable: saving programs on drives 0, 1, 2 and 3 without flipping the disks, or saving programs on drives 0 and 1, which means flipping the disks, notching and punching out the other side of the disks?

William Gosz  
APO New York

Start isolating your problem by trying your computer with your friend's controller. If the problems disappear, your controller is the problem. Otherwise return the new CoCo 3 computer to Tandy for replacement. If it is the controller, try swapping disk controller ROMs. It is possible that your friend's ADOS is set up to use 40 tracks, etc. If after the ROM swap you still cannot read his disks, I suspect your controller is at fault.

The F1 and F2 function keys are available to Disk BASIC programmers by polling the keyboard rollover table. They can be more directly sensed via their ASCII codes in OS-9. I have not had any problems with flipped-notched disks on single-sided drives. With double-sided drives and in Disk BASIC, I find accessing the back side of the drive via a different drive number more convenient.

## Need More Memory

I would like more information about the MMU (Memory Management Unit) task segments and how to switch banks of RAM. I have the CoCo 3 upgraded to 512K and don't know how to access the memory. I know that the computer banks its memory into 64 blocks of 8K bytes. For example, suppose I want to write \$40 in all of the memory (512K) and reset it back afterwards. What is the listing in machine language? I ask this because I have built an expansion relay with LEDs, and I need lots of memory to store data. I gained some of the information I have from THE RAINBOW (March '89, Page 18, Table 1).

Jean Gravelle  
Gatineau, Quebec

A detailed explanation, along with example code that loads and saves Hi-Res screens, can be found in the January '87 issue of THE RAINBOW, Page 167.

### Looking for Mighty Modem

I have been looking for a 9600-baud modem. I know they are made, but I can't find one.

Geoff Hall  
Casselberry, Florida

Look for ads in *Byte Magazine* and *The Computer Shopper*. Be prepared, though — they are expensive!

### Pocket These Patches

I just read your article in the July '89 issue of *THE RAINBOW* and saw a reference to the OS-9 Pascal patch with an inquiry for patches for the other Pascal programs. I discovered the following patches on a local BBS:

```
l Pascal
c 697 21 25
c 1692 21 25
v
```

```
l pascals
c a5d 21 25
c a82 21 25
v
```

```
l pascale
c 23E 21 25
v
```

```
l pascaln
c 99F 21 25
c 9C4 21 25
```

I contacted Mr. Scranton, the author, and obtained his permission to send these to you. Mr. Scranton lives in Columbus, Ohio.

Robert E. DeBolt  
Pickerington, Ohio

Thanks for the Pascal info.

### If You Want My Advice...

I want to comment on some of your answers in June's *RAINBOW*. I realize that a question-and-answer column can't be perfect, but one user who had a 35-track problem with OS-9 could have followed quite a few other methods to fix his problem. First of all, his system should have given him a Read Error, not when running 40 tracks, but when he used his 35-track system master in the drive. I run with 40-track double-sided systems 100 percent of the time, but I regularly read and copy standard Radio Shack single-sided 35-track

disks when I buy software there. Secondly, you should have mentioned that the format command has options for both the number of sides and the number of tracks. When running in 40-track mode, the user can easily format any number of 35-track disks for backup of other 35-track disks.

Mark S. Ritchie  
Garland, Texas

Granted, a 40-track drive set up as such can read 35-track disks. The point I was making is that the converse is not true. You will have problems reading a 40-track disk if your OS-9 device descriptor is set up for 35 tracks.

### Let's Get Something Straight

In reference to your answer (July '89) to Phillip Brown, OS-9 makes use of hardware names to tell the system what a given device looks like. It passes this info to a driver. The driver is the actual software connection to a given piece of hardware. The following data was gleaned from the addendum manual of OS-9 Level 1 Revision 2.00.00:

| Driver  | Descriptor |
|---------|------------|
| printer | /P<br>/T1  |
| aciapak | /T2<br>/T3 |
| modpak  | /M1<br>/M2 |

The following notes should be used for the above: /m1 and /m2 are always the Modem Pak; /t2 and /t3 are always the serial pak or equivalent; aciapak is the driver used when the MPI mapped hardware does the interrupt processing; and modpak is a specialized driver that makes use of something called a "virtual software interrupt." The overhead from its use is such that normally it works well only at 300 baud (although I've gotten feedback that it will work faster given certain caveats). This driver works with any ACIA port hardware but gives one the freedom to place the port in any slot. The modpak driver requires some patching as there is a known bug in its F\$EXIT call. (It seems like it should work but often glitches up a program exit.)

At any rate this info should make the

details clear. Please readdress your answer to Phillip Brown because your first answer is misleading and wrong.

Paul B. Pollock  
Sepulveda, California

My answer, I admit, might be construed as an oversimplification. However, it is not wrong. I might add that if you inspect the binary t1.dd, you will discover that it uses the sio device driver, not printer. My answer is consistent with the Tandy-supplied OS-9 Level II documentation (Pages 1 through 3). It identifies /m1 and /m2 as being device descriptors for the optional 300-baud Modem Pak, and it describes /t2 and /t3 as being for the optional RS-232 Pak.

### A Bland Screen

I recently purchased a 128K CoCo 3 and a CM-8 RGB monitor to replace my CoCo 1 and TV. I also have an FD-500 drive and CCR-81. My problem is that some programs in color on my CoCo 3 only show up in black and white on my CoCo 3 (e.g., *Rescue by Stephen C. Mitchell*, December '84, *THE RAINBOW* and *Pitstop II* from Radio Shack). Is there something wrong with my CoCo 3 or monitor?

Brad Kolman  
Madison, Wisconsin

The games referred to use artifacted colors. These colors, which can be produced on a television set or monitor with composite video inputs, were not in the design specification for the original Motorola 6883 Video Display Generator used with CoCos prior to the CoCo 3. The Tandy CM-8 monitor is RGB-only. Other monitors such as the Magnavox Professional 8515 have inputs for both composite video and RGB and can produce artifacted colors in the composite video mode.

For a quicker response, your questions may also be submitted through *RAINBOW*'s CoCo SIG on Delphi. From the CoCo SIG > prompt, pick *Rainbow Magazine Services*, then, at the *RAINBOW* > prompt, type ASK for "Ask the Experts" to arrive at the EXPERTS > prompt, where you can select the "Doctor ASCII" online form which has complete instructions.

This month I'll start with a personal item about a couple of our SIG members — the sort of thing you might not be able to find out elsewhere.

**Sharon Blower** (SEBJMB) managed to break 2000 in the CoCo SIG's *Scramble*. Her score of 2004 is most certainly a high for the CoCo SIG and a high score for anywhere on the system. Her hottest competition is **Art Flexser** (ARTFLEXSER) although several other SIG members are in active pursuit.

Sharon computes from a 512K CoCo 3. She is an emergency planning specialist for an electrical utility at a nuclear power generating plant. She and her husband Jeff live in New Cumberland, West Virginia. Feel free to join Sharon and Art online almost any night for a rousing game of *Scramble*.

### KEYSUB Helper

Have you tried the /KEYSUB command in Conference? It's a great way to speed up your conferences as well as save some wear and tear on your fingers.

/KEYSUB has just been enhanced to provide macro parameter substitution, and to save or load keyboard substitutions from files in your Workspace. Type /KEYSUB ? for help, /KEYSUB param or /KEYSUB file for additional information online. Here are the valid keyboard substitution commands:

- To list the definitions: /KEYSUB
- To add or change a definition: /KEYSUB \$trigger\$results\$ (any punctuation character can be used instead of \$ as long as the same character is used in all three positions)
- To delete a definition: /NOKEYSUB \$trigger\$
- To delete all definitions: /NOKEYSUB
- For help: /KEYSUB ?

Up to 20 keyboard substitutions can be active at a time. For example, entering /KEYSUB \$.\$/SEND JQP1 \$ causes a line reading .hi john to be interpreted as if you had typed /SEND JQP1 hi john.

In this example the period (.) is called the *trigger string* because the substitution

---

*Don Hutchison is an electrical engineer and lives in Birmingham, Alabama. He works as a senior project engineer involved in the design of industrial control systems. On Delphi, Don is the Database Manager of the RAINBOW CoCo SIG. His Delphi username is DONHUTCHISON.*

---

## Then there's terminal emulation

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# KEYSUB and WEFAX and Guide — Oh, My!

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By Don Hutchison  
Rainbow Contributing Editor

---

is triggered by finding a period at the start of a line. /SEND JQP1 is the *result string* because the substitution results in replacing the trigger string with the result string. The space between JQP1 and \$ is important; without it the command is translated as

/SEND JQP1hi john. To cancel this substitution, type /NOKEYSUB \$. \$.

Note that /KEYSUB \$\$/SEND JQP1 \$ causes everything you type to be interpreted as /SEND JQP1 unless some other substitution is active at the same time. If you make one of these catchall substitutions, you can type /NOKEYSUB to undo it; /EXIT and /BYE are recognized in any case.

### WEFAX

Considerable interest has been focused lately on weather maps. Several SIG members are interested in obtaining, viewing and using these freely available sources of information. *WEFAX*, a long-time favorite program of CoCo owners, has been the subject of a lot of attention in the CoCo SIG's Forum recently. **Marty Goodman** (MARTYGOODMAN), the distributor of the programs, explains the programs and their uses:

"*WEFAX* is the format used to transmit weather maps and satellite images of Earth over shortwave radio. The protocol was formed in the '30s and '40s — long before digital computers. At that time tube-based analog equipment and mechanical analog devices were used to send and receive the pictures, which were mainly hand-drawn

## Database Report

By Gregory A. Law  
CoCo SIG Database Manager

### OS-9 SIG

Applications: **Mike Sweet** (DODGE-COLT) contributed *ED* Version 1.4, which supports lines longer than 80 characters, adds highlighting for block commands, and adjusts to the size of the window. **Mike Brant** (MBRANT) provided a quiz program that uses a text file for the questions and answers. It also prints to the printer or a disk file the questions and answers you missed. Mike also provided a BASIC09 program that measures ambient chaos. **Raymond Mayeux** (RAYMAYEUX) uploaded an update to the *TODAY* program that adds the ability to display the Julian date and the number of days left in the year.

Utilities: **Mike Woolley** (WOOLLEY) uploaded a program that prints either the decimal and hexadecimal values of a given character or the entire ASCII chart.

Patches: **Larry Oheron** (LOHERON)

posted a patch to the Pascal compiler so it prints error message descriptions with error numbers.

Telcom: **Dennis Hoin** (HACKER1) contributed *Memory Master*, a game designed for use with BBS systems that tracks the top ten scores. **Ryszard Sliwinski** (RYSIEK) submitted a patch for the fileout procedure in *RiBBS* Version 2.0 to provide support for Kermit and a modified version of Kermit so the server functions properly. **Bill Brady** (OS9UGED) posted an update to *WizPro* that fixes a few minor bugs after running *XProg*.

Graphics and Music: **Mike Knudsen** (RAGTIMER) contributed a jukebox player for all levels of *UltiMusE* files, allowing you to play your musical compositions in any order and "Now is the Month of Maying" for *UltiMusE*. **Jim Buck** (CO-COROGUE) submitted "Stairway to

weather maps. The protocol (a slow but very rugged one) survives to this day and is used by dozens of shortwave stations (most of them operated by various governments) to provide weather information to ships at sea and to others who want it.

"Using the *WEFAX* program and any shortwave receiver that supports BFO or SSB, you can receive *WEFAX* transmissions from all over and view them on your screen or printer. The *WEFAX* software does almost all of what you need. The *WEFAX* hardware interface needed is trivial: just a few plugs, a resistor and a couple of LEDs.

"*WEFAX* is in the public domain, too. The CoCo *WEFAX* program has been used by hurricane watch organizations in Florida. I've gotten several letters from owners of ships at sea thanking me for the excellent guidance they got from land-based friends who were using the *WEFAX* program to capture weather maps."

Contact Marty through Delphi Mail or the CoCo SIG for more information.

#### Guide to Delphi

*Delphi: The Official Guide*, by Michael A. Banks (KZIN) is a hardbound 500-page book designed to get you "up and running" on Delphi and serves as a continuing reference. In its pages you'll find everything you need to know to get the most from your time on Delphi. It is a Brady Book published by Prentice Hall Press.

*Delphi: The Official Guide* is a complete resource to Delphi services. The manual includes descriptions of menus, timesaving tips for the advanced user, an index of Delphi services, a Dial-Up Guide, a technical reference section, a troubleshooting guide, a glossary of terms and a Command Reference Card.

You can order the *Delphi: The Official Guide* for \$19.95 plus \$3 for shipping and handling at the main menu. Just enter

USING MANUALS at the MAIN> prompt. You may also purchase the guide at many fine bookstores, including B. Dalton, Coles and Waldenbooks.

**A terminal is a device that can consist of just a keyboard and some electronic circuitry. When you choose a terminal emulation, you are really defining how the Color Computer (acting as a terminal) responds to different criteria.**

#### Terminal Emulations

Several questions have arisen lately from some of our users concerning which of the available terminal emulations is best suited for use with Delphi. That's a difficult question to answer. It's almost like asking, "Which ice cream do you prefer: vanilla, chocolate or strawberry?" My choice depends on my mood at the time.

Anyway, let's take a look at this thing called *terminal emulation*. That's really just a technical way of saying something imitates a certain type of terminal. In other words you are going to make your Color Computer act like a specific terminal. A

terminal is a device that can consist of just a keyboard and some electronic circuitry (not much more hardware than a typewriter in some cases).

When you choose a terminal emulation, you are really defining how the Color Computer (acting as a terminal) responds to different criteria. In effect you are choosing a standard method of displaying graphics, setting screen attributes, etc. That way all terminals of one type look and act the same. You can conceivably connect the CoCo to a mainframe directly, as long as you are emulating the terminal type the mainframe computer expects.

Without going too deeply into the pros and cons of the different emulation modes, let's look at what's available:

- **CRT** — Very basic. Doesn't do very much. Good for most BBSs since they don't expect much out of your terminal. This terminal sends the characters typed from your keyboard to the remote computer, displays on your screen the characters sent by the remote computer to you, and does very little else. (If in doubt about which terminal emulation to use with a BBS, CRT is usually the preferred choice.)

- **VIDTEX** — Generally useful only on CompuServe although some BBSs support *VIDTEX* codes. *VIDTEX* is really a complex set of codes that allows the cursor to be positioned at will on your screen. This feature can be used to create some interesting text graphics (like a valentine heart) without the need to draw the graphics line-by-line. *VIDTEX* terminal programs usually support the display of high-resolution (PMODE 4) graphics sent to it in a special format that it can identify.

- **VT-52** — This is an old standard. It includes a few cursor positioning commands, gives you several extra keys, allows a character graphics mode and not too much more.

- **VT-100** — Probably the most power-

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ful terminal emulation with the possible exception of *VIDTEX*. VT-100 supports a large number of escape sequences that tell the terminal to do such things as position the cursor, turn on/off bold, blinking, inverse video, change character sets, use double-height/width characters, and turn on/off many features such as wrap-around at Column 80. It also supports scrolling regions — you can tell the VT-100 that only a certain part of the screen is to scroll and that the rest stays put. This is used a lot in editors because it allows full-screen editing from your terminal. You can set tab locations as well. VT-100 is a very powerful terminal emulation and quite difficult to emulate accurately.

There are any number of other terminals floating out there that are commonly emulated. One example is a Tektronics terminal that does graphics. Most of these are not widely supported in terminal programs, however.

There are also later, larger versions of the VT-100, such as the VT-102 and the VT-220.

Many SIG users prefer *V-Term*, marketed by Gimmesoft. They usually leave *V-*

*Term* in the VT-100 emulation mode. If they happen to be online with a system that doesn't take advantage of its VT-100 support, nothing is lost. Online Delphi supports a few of the VT-100 commands to clear the screen and home the cursor.

### Editing Messages in the Forum

In Forum when you use **ADD** or **REPLY** to create a message, you start out in a "mini-editor." Many folks don't realize this. To see for yourself, type **/HELP** at the beginning of a message line and you'll see the following help screen displayed on your computer:

```
/LIST - lists all lines typed
/DELETE - erases the last line
/EDIT - invokes your editor
/EXIT - same as CTRL-Z
/QUIT - same as CTRL-C
```

For more sophisticated editing use **/ED** (at the beginning of a line) to call up either the **EDT** or **OLDIE** editors, whichever you have selected as your default editor.

You can also begin your message in the Edit mode in Forum with **ADD /EDIT** and **REPLY /EDIT**.

### Designing with OS-9

A SIG member provided me with an interesting news item: "In a recent issue of a technical publication, I was surprised to find a short article, 'Real Time Audio/Video Environment,' which lets engineers construct custom instrument panels by combining images of dials, meters and switches on a computer screen. The *RAVE* software runs under the OS-9 operating system and is sold by Microware Systems Corporation of Des Moines, Iowa. I for one was very surprised to see the name, which shows up on so many CoCo screens!"

**Kevin Darling** (OS9UGPRES) quickly replied: "The last MOTD (the OS-9 User's Group newsletter) also had full coverage of *RAVE*. Microware is fairly well known in the controller world. GM is even thinking about moving over to it for its car computers. NASA has been the biggest OS-9 user for quite some time. Guess what it uses to handle launch communications and shuttle fueling and telemetry? Right!"

See how many interesting information tidbits can be picked up in the Forum sections of our SIGs? Join us online to learn more.

□

Heaven" by Led Zeppelin for *UltiMusE*. **Bert Schneider** (OS9BERT) posted a series of files that allow you to run *UltiMusE III* under *Multi-View*. **Mike Schneider** (MSCHNEIDER) submitted Mac sound files of Mighty Mouse singing "Here I Come to Save the Day," the Blues Brothers' song from the movie of the same name, the Church Lady saying "Well, isn't that extra special," and a song from the movie *Batman*. **Zack Sessions** (ZACKSESSIONS) contributed a series of programs used to make several variations of a graphics demonstration system.

**John Kou** (BAMBOO) posted several songs from the books "Sacred Songs for your Wedding," arranged by Paul Mickelson, "Well-Tempered Praise II" and "Piano Arrangement of Celebration, Worship, and Praise" by Mark Hayes for *UltiMusE*. **Warren Moore** (WJMOORE) submitted *Nuts*, a BASIC09 game/puzzle for the CoCo 3. **Dave Philipsen** (DPHILIPSEN) contributed a revised version of *Play* that supports imbedded sound file codes and command line parameters and works with *Multi-View*.

Programmers Den: Mike Sweet posted a random number generator for C and BASIC09 with a cycle length in the trillions. **Mark Farrell** (XLIONX)

uploaded *CC2&*, a concurrent C executive with help.

### CoCo SIG

General Information: **Don Hutchison** (DONHUTCHISON) posted a document describing the standards for uploading material to the CoCo SIG databases and a complete, up-to-date listing of all the local access numbers for Telenet. **Steve Bjork** (6809ER) contributed the transcript from the Game Conference held on July 3rd. **Gay Crawford** (GAYCRAWFORD) submitted a list of 40 lawn care pesticides and their known health hazards and included a list of publications and organizations offering advice on chemical-free lawn care.

CoCo 3 Graphics: **Pete Ellison** (PETEELLISON) contributed a 4096-color image of an actual structure fire that was taken by a Rascan digitizer and images from *The Terminator*, *The Stranger*, *Mickey Mouse* and a Rascan slide show program. **Richard Trasborg** (TRAS) posted some pics of his favorite lady taken with the DS69-B digitizer. Mark Farrell submitted some GIF images of Samantha Fox. **Tommie Taylor** (TOMMIETAYLOR) posted several GIF images including *Star Wars* and a cherry coke.

Utilities and Applications: **Bryan Stephens** (BRSTEPHENS) contributed a

short, simple disk editor useful for preparing binary files to be burned into an EPROM, and a position independent machine language monitor for the CoCo 3. **Fred McDonald** (FREDMCD) submitted a utility that can copy, kill, list, search and back up files from one drive to another for the Hyper I/O Hard Drive package. **Donald Jereczek** (DONJERE) posted Version 2.8 of *The Financial Calculator*, providing formats for input loans, loans paid and search routines to find the loans in the file. **Marty Goodman** (MARTYGOODMAN) contributed a brief article describing how you can piggy-back four 4164 memory chips on an 18-pin header to make it behave like one 4464 memory chip in a CoCo 3.

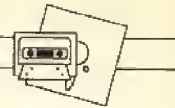
Games: **Jeff Voegeli** (TEK) posted a program to help keep track of dart scores for one to four players.

Music and Sound: **Bill Jackson** (BILLJACKSON) submitted a bare-bones voice editor for the TX81Z four operator Yamaha tone module. John Kou posted a collection of Christian music for *Lyra*.

Telecommunications: **Rick Adams** (RICKADAMS) contributed Version 1.1 of *GameTerm* that provides a graphic interface for use with games on Delphi including a unique real-time conferencing "doodle" mode.

☺

# Novices Niche



THE RAINBOW is a teaching environment and we realize that the majority of our readers will always be beginners. In our continuing effort to always keep the new user in mind, and in addition to the many beginner feature articles and programs published in every issue, "Novices Niche" contains shorter BASIC program listings that entertain as well as help the new user gain expertise in all aspects of the Color Computer: graphics, music, games, utilities, education, programming, etc.

## Graphics

### Draw Figures Using Asterisks

By Tio Babich

16K  
ECB

If you find it hard to create figures or symbols for games and other programs, run this program to learn a neat trick. *Figure Draw* is a small but interesting program/subroutine written for the Color Computer. This routine allows the user to draw a picture within the data lines using asterisks (list the program for a better understanding). This is useful for drawing small, otherwise hard-to-plot figures or symbols. Try changing data in lines 10 through 23 to produce more interesting designs.

The Listing: FIGDRW

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 DATA"          *****  "
11 DATA"          * * *      "
12 DATA"          *****  "
13 DATA"          *****  "
14 DATA"          ***  *****  ***  "
15 DATA"          ***  *****  ***  "
16 DATA"          ***  ***      ***  "
17 DATA"          ****  *****  ****  "
18 DATA"          **   ***  ***   **   "
19 DATA"          ***   ***      "
20 DATA"          ***   ***      "
21 DATA"          ***   ***      "
22 DATA"          **    **       "
23 DATA"          ****   ****   "
100 REM**DRAW ON GRAPHICS SCRNM**
102 IF S=0 THEN S=1:S=VARIABLE
   DECIDING HOW FAR FROM SIDES,
```

```
FIGURE IS TO BE DRAWN, GOOD FOR
LATER "GET"-ING OF THE FIGURE.
103 PM=4:SET PMODE VALUE,BEST
RESULTS OBTAINED WITH 4 OR 2.
104 PMODE PM:PCLS
105 CLS
110 FOR F=1 TO14
130 READ A$:FORG=1 TO LEN(A$)
140 G$=MID$(A$,G,1)
150 PRINTG$;
151 IF G$="*" THEN COLOR 1 ELSE
COLOR 0
152 PSET(G+S,F+S)
160 NEXT G
170 PRINT
180 NEXT F
190 PRINT"HIT ANY KEY TO SEE THE
   FIGURE ONTHE GRAPHICS SCREEN.";
192 EXEC44539
193 SCREEN1,1
194 G=G+1:F=F+1
198 DIM E(S+G,S+F):GET(100,100)-
(100+G,100+F),E
199 DIM V(S+G,S+F)
200 GET(S,S)-(G+S,F+S),V
210 FOR X=100TO 190
215 PUT (X,X)-(G+X,F+X),V
216 EXEC43345:POKE140,X+G
220 PUT (X,X)-(G+X,F+X),E
222 NEXT:FOR T=1TO3::PLAY"L22;V31
;A;V21;A;V10;A":NEXTT
223 CLS:PRINT"PLEASE FEEL FREE T
O ADD THIS   SUBROUTINE TO YOUR
OWN PROGRAMS."
1000 REM***BY TIO BABICH****
```

# Pardon Me, I Didn't See the Sign

## By Alejandro Lopez Rodriguez

CoCo 3

Here is a graphics-animation program that uses HSCREFN 4 (640-by-192 screen). For that reason only CoCo 3 owners can run it. Just type the program, save it on tape or disk, and type RUN. A similar program published in Novices Niche, May '88, does not require a CoCo 3.

### The Listing: NOSMOKE

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 '*****
20 '      N O   S M O K E
30 '           B Y:
40 ' ALEJANDRO LOPEZ RODRIGUEZ
50 '      JULY, 25 1989
60 ' GUADALAJARA, JAL, MEXICO.
70 '*****
80 POKE65497,0:ONBRKGOTO220:HBUF
F1,1900:HBUFF2,2000:HBUFF3,1500:
HBUFF4,300:HBUFF5,200:HBUFF6,200
0:FORA=0T03:PALETTEA,63:NEXTA:HS
CREEN4:HCOLOR2:X=320:Y=105:Z=90
90 HDRAW"BM320,100R200BD10L200BU
10":HCIRCLE(X,Y),5,2,2:HCIRCLE(5
20,Y),5,2,2,.75,.25:HCIRCLE(380,
Y),5,2,2,.75,.25:HPAINT(325,101)
,1,2:HGET(300,Z)-(540,120),1
100 HCLS0:HDRAW"BM320,100D70R70U
70L70;U10R1U2R2U2R2U1R30D10R35D5
;U10R10U3L32":HCIRCLE(355,88),13
,2,1,.6,.25:HCIRCLE(340,92),3
110 HCIRCLE(340,92),3:HPAINT(330
,101):HPAINT(380,Z),3,2:HPAINT(3
57,Z),1,2:HGET(370,80)-(402,Z),5
:HGET(310,81)-(410,101),2:HGET(3
15,170)-(400,172),6:HCLS0
```

```
120 HDRAW"C1BM320,100;U5L1U3L1U2
L2U2L2U2L2U2L2U3L1U5L1U5R1U5R1U3
R1U3R2U2R2U2R2U3R2U5R1U5;D5R1D5R
2D3R2D2R2D2R2D3R1D3R1D5R1D5L1D5L
1D3L2D2L2D2L2D2L2D2L1D3L1D5BM315
,50L30BD10R20":HPAINT(X,Z),1,1
130 HCIRCLE(X,75),6,3,3:HPAINT(X
,75),3,3:HCIRCLE(X,75),2,2,2
140 HGET(300,95)-(335,40),3:HCLS
0:FORA=X T0340STEP3:HCOLOR2:HLIN
E(A,100)-(A,110),PSET:NEXTA:HGET
(X,100)-(340,110),4:HCLS0:PALETT
E1,52:PALETTE2,11:PALETTE3,32
150 FORA=191T040STEP-1:HPUT(220,
A)-(460,A+30),1:NEXT A:GOSUB210:
FORA=191T092STEP-1:HPUT(420,A)-(
520,A+20),2:IF A<100THENHPUT(425,
A+Z)-(510,A+92),6
160 NEXTA:GOSUB210:HPUT(480,97)-
(512,107),5:HPUT(420,95)-(455,40
),3:GOSUB210:HPUT(420,92)-(520,1
12),2:HPUT(425,182)-(510,184),6
170 HPUT(220,40)-(460,70),1:HPUT
(425,50)-(445,60),4:HPUT(425,50)
-(445,60),4:HLINE(420,95)-(455,7
0),PRESET,BF:HGET(220,40)-(460,7
0),1:GOSUB 210:FORA=92T0191:HPUT
(420,A)-(520,A+20),2:IF A<Y THENH
PUT(425,A+Z)-(510,A+92),6
180 NEXTA:HGET(0,0)-(100,55),2:H
PUT(420,136)-(520,156),2:GOSUB21
0:FORA=40T085:HPUT(220,A)-(460,A
+30),1:NEXTA:GOSUB210:HCOLOR3
190 HCIRCLE(350,96),180:HCIRCLE(
350,96),140:HCIRCLE(350,96),140,
0,1,.35,.39:HCIRCLE(350,96),140,
0,1,.84,.89:HDRAW"BM245,145M+172
,-110BM+32,+12M-176,+109"
200 HPAINT(350,10):GOTO 200
210 FOR A=1T02000:NEXTA:RETURN
220 CLS:RGB:POKE 65496,0:END
```

## Utilities

### Automile

#### By Dan Weaver

16K  
ECB

Do you ever get confused when you try to figure out how many miles per gallon your car gets? I'm sure some of you don't because you have computers in your cars that do this for you. Some of you, however, are driving cars that are older than the personal computer. If you own a car that's dated PC (pre-computer), *Automile* can do the job for you.

Of course you still have to jot down some figures on your trip. First you must have a full tank of gas when you begin your trip. You must also record the odometer reading at the beginning and end of the trip and the number of gallons it took to fill the tank at the end of the trip. The computer then figures out your miles per gallon. If you enter the amount of time the trip took, this program

calculates your average miles per hour; if you enter the price per gallon of gasoline, it figures out your cost per mile for gasoline. Now if I can just figure a way to run my CoCo off my never-used cigarette lighter!

### The Listing: AUTOMILE

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 CLS
20 PRINT@198,"////AUTO MILEAGE\\
\\"
30 PRINT@271,"BY"
40 PRINT@331,"DAN WEAVER"
50 PRINT@32,STRING$(32,239)
60 PRINT@448,STRING$(32,239);
70 FOR X=1 TO 2000:NEXTX
```



```

80 PU$="###.##"
90 CLS
100 INPUT "MILEAGE ON ODOMETER AT
    BEGINNING OF TRIP";BM
110 INPUT "MILEAGE ON ODOMETER AT
    THE END OF TRIP";EM
120 INPUT "HOW MANY HOURS DID THE
    TRIP TAKE (CHANGE MINUTES TO DEC
   IMAL. EXAMPLE: 45 MIN.=.75)";
    TT
130 INPUT "NUMBER OF GALLONS PUT
    IN TANK AT END OF TRIP";GG
140 INPUT "PRICE PER GALLON";PG
150 TM=EM-BM
160 MPG=TM/GG
170 CLS
180 PRINT "trip summary"
185 PRINT "TOTAL MILES TRAVELLED
";TM

```

```

190 PRINT "MILES PER GALLON
";:PRINT USING PU$;MPG
200 PRINT "AVERAGE MILES PER HOUR
";:PRINT USING PU$;TM/TT
210 PRINT "CENTS PER MILE FOR GAS
";:PRINT USING PU$;PG/MPG*100
220 PRINT
230 PRINT "based on following inf
    ormation"
240 PRINT "1ST ODOMETER READING "
    BM
250 PRINT "2ND ODOMETER READING "
    EM
260 PRINT "NUMBER OF HOURS "
    TT
270 PRINT "NUMBER OF GALLONS "
    GG
280 PRINT "PRICE PER GALLON "
    PG

```

## Hi-Res Graphics Utility By Ric Pucella

CoCo 3  
Disk

I think the CoCo 3 is perfect. I especially like the high-resolution graphics capabilities. The only thing missing is a good, clean way to save the HSCREENs.

That's why I developed the *HRG* utility. It is a set of ML routines accessible via *USR9* to allow the saving and loading of

high-resolution screens. It also includes the option of displaying the screen (like *HSCREEN*) but without clearing it.

To use the program just type it in and run it. After a while it saves the binary file to disk and executes it. If you are using a tape recorder, simply change the *SAVEM* in Line 130 to *CSAVEM*. Don't forget to press the Play and Record buttons prior to running the program.

Afterward when you want to use the *HRG* utility, simply load the file saved by the program. You can execute *HRGCOM* from a

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program or from direct mode. In the latter case it prints a short summary of the possible commands. Let me explain them:

To save the high-resolution screen, use:

```
A$=USR9(0), "filename"
```

The variable in front of the expression (in my example, A\$) is a dummy variable. To load a screen back, use:

```
A$=USR9(1), "filename"
```

To display the high-resolution screen without clearing it, use:

```
A=USR9(2), mode:EXEC44539
```

Replace the word mode with the number of the HSCREEN you want (from 0 to 4). For example:

```
A=USR9(2).2:EXEC44539.
```

The HRG utility is simple to use and incredibly useful.

**The Listing:** HRGCOM

```
0 ' COPYRIGHT 1989  FALSOFT, INC
10 '   HRG UTILITY
20 '
30 ' BY RIC PUCELLA
40 ' (C) 1989 DEBBIE SOFTWARE
50 '
60 ' AN UTILITY TO ADD NEW
70 ' COMMANDS TO HANDLE THE
80 ' HIGH RESOLUTION SCREEN.
90 '
100 CLS
110 L=&HD900
120 PRINT:PRINT"LOADING DATA..."
```

```
:GOSUB160
130 PRINT:PRINT"SAVING MACHINE F
ILE...":SAVEM"HRGCOM",&HD900,&HD
A8F,&HD900
140 PRINT:PRINT"EXECUTING
'HRGCOM'.":EXEC&HD900
150 END
160 READA$:FORI=1TOLEN(A$)STEP2:
B$=MID$(A$,I,2):IFB$="**" THEN R
ETURN ELSE POKEL,VAL("&H"+B$):L=
L+1:NEXT:GOTO160 'ML LOADER
170 DATACCD9A8FD09719E6830012606
8ED912BDB99C390D484947482D524553
4F4C5554494F4E204752415048494320
4E45570D434F4D4D414E445320494E53
54414C4C45442E2E2E0D0D2041243D55
5352392830292C46494C454E414D4520
202020544F20534156450D2041243D55
5352392831292C46494C454E4
180 DATA4520202020544F204C4F4144
0D20413D555352392832292C48534352
45454E202020544F20444953504C4159
0D00BDB3ED4F5D102700815A27225A27
037EB44A9DA5BDB26DBDB70BC1041022
DA828621B7E6C6BDE69C868DB7E6C639
9DA5BDB26D8EDA8CBDC938BDCA07FC09
578304001026CC288670B7FFA
190 DATADA8BBDCDBC3402BDD0131F02
BDD0131F01A6E01026CA22BDC5C4D670
27037EC334A784A18027037ED616313F
26E9B6DA8B4C817425C68679B7FFA17E
A42D9DA5BDB26D8EDA8CBDC938CC0400
FD0957BDCA048670B7FFA1B7DA8B4FBD
CFB5CC20001F02BDCFB3CC20001F01BD
CFB3A680BDCC24313F26F7B6D
200 DATA4C817425D58679B7FFA186FF
BDCFB54F5FBDCFB3CC0000BDCFB37EA4
2D81485247D6**
```

## Game

### Car Bingo Game By Warren Cheves

16K  
ECB

Parents, before venturing out on long road trips remember that children usually want games to play while traveling. *Bingo* is a game made specifically for those occasions. It prints 4-by-4 or 5-by-5 bingo card consisting of two-character state abbreviations. As the child or parent sees a car license plate that matches one of the entries on the bingo card, he/she circles it. The first player to circle four or five entries in a row vertically, horizontally or diagonally is the winner.

After loading the program, type RUN and press ENTER. You are asked to enter the number of states. Enter 16 if a 4-by-4 card is desired or 25 for a 5-by-5 card. The CoCo then prompts you to enter the two-letter abbreviations for each of the 16 or 25 states desired. (Hint: Choose states for which you expect to see license plates. For example, if I travel from Tennessee to Mississippi, I won't list Oregon. You can also use FR — free space as an entry.)

After you enter all 16 or 25 states, the CoCo prints the bingo card on your printer. The program then asks if another bingo card is to be printed. You may want to print several so each member in the car can play more than one game. The CoCo then prints another card with a different arrangement of the same 16 or 25 states. The main routine in this program is found in lines 200 through 260. These lines randomly sort the states to produce a different bingo card for each person.

Happy motoring!

**The Listing:** BINGO

```
0 ' COPYRIGHT 1989  FALSOFT, INC
10 REM "BINGO"
20 CLS
30 PRINT "ENTER NUMBER"
40 PRINT "OF STATES (16 OR 25)"
50 INPUT N
60 IF N=16 THEN GOTO 90
```

```

70 IF N=25 THEN GOTO 90
80 GOTO 20
90 DIM X$(N)
100 DIM S$(N)
110 FOR I=1 TO N
120 CLS
130 PRINT "ENTER STATE"
140 PRINT "NUMBER ";I
150 PRINT "(USE TWO LETTER"
160 PRINT "ABBREVIATION)"
170 INPUT X$(I)
180 NEXT I
190 REM *ROUTINE TO RANDOMLY
    SORT STATES*
200 FOR B=1 TO N
210 A=N+1-B
220 X=RND(A)
230 S$(B)=X$(X)
240 X$(X)=X$(A)
250 X$(A)=S$(B)
260 NEXT B
270 REM *END OF RANDOM SORT
    ROUTINE*
280 IF N=16 THEN GOSUB 400
290 IF N=25 THEN GOSUB 600
300 CLS
310 PRINT "DO YOU WANT TO PRINT"
320 PRINT "ANOTHER GAME (Y/N)"
330 INPUT C$
340 IF C$="Y" THEN GOTO 190
350 IF C$<>"Y" THEN END
400 A$=" "
410 FOR I=4 TO 16 STEP 4
420 PRINT #-2,S$(I-3);A$;S$(I-2)
    ;A$;S$(I-1);A$;S$(I)
430 PRINT #-2
435 NEXT I
440 FOR J=1 TO 5
450 PRINT #-2
460 NEXT J
470 RETURN
600 A$=" "
610 FOR I=5 TO 25 STEP 5
620 PRINT #-2,S$(I-4);A$;S$(I-3)
    ;A$;S$(I-2);A$;S$(I-1);A$;S$(I)
630 PRINT #-2
635 NEXT I
640 FOR J=1 TO 5
650 PRINT #-2
660 NEXT J
670 RETURN

```

Submissions to "Novices Niche" are welcome from everyone. We like to run a variety of short programs that can be typed in at one screen sitting and are useful, educational and fun. Keep in mind, although the short programs are limited in scope, many novice programmers find it enjoyable and quite educational to improve the software written by others.

Program submissions must be on tape or disk. We're sorry, but we cannot key in program listings. All programs should be supported by some editorial commentary explaining how the program works. If your submission is accepted for publication, the payment rate will be established and agreed upon prior to publication.

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*You've always been a ham at heart*

# CoCo and Amateur Radio: A Natural Combination!

By Steven R. Ford

**T**hink you've exhausted the list of unique things to do with your Color Computer? Then you have probably never heard of amateur radio — a fascinating hobby that counts many computer users among its ranks. Even so, surprisingly few people know of its potential.

## What Is Amateur Radio?

Amateur radio is usually better known by its nickname, *ham radio*. It has been in existence since the very first days of radio. Many people have a tendency to confuse amateur radio with citizens band (CB), though there are few similarities.

Compared to amateur radio, CB is a fairly limited hobby. It restricts the user to voice communication on a narrow band of frequencies (channels). You may recall that CB enjoyed a burst of popularity in the mid '70s when it became fashionable to have a CB transceiver in every automobile. However, the sudden crush of the competing signals caused enormous interference problems. As a result the fad began to lose steam and finally faded away altogether.

Of course CB itself survived the fad and is still very much alive today. CB'ers have always provided an invaluable service during emergencies and continue to do so.

Still, the serious limitations of CB restrict its usefulness as a hobby — especially for computer users.

Amateur radio, on the other hand, is rich

and varied with a broad range of activities available for the licensee. Hams have a large number of frequencies at their disposal, beginning just above the AM broad-

## A Once-in-a-Lifetime Opportunity

By the time you read this, the FCC may be considering (for the first time in history) an amateur radio license that doesn't require learning Morse code.

Why should this interest you? Because the hottest, fastest growing modes in amateur radio are digital modes — communicating by computer. Ham operators are sending data, programs and messages around the world (for free) every day via "packet radio." In recent weeks, for example, I exchanged a dozen messages with a vacationing ham operator touring Alaska with his portable radio. Messages from a campground in Whitehorse (in Yukon territory) were in my hands within 24 hours — all relayed automatically by the nationwide packet system. If you want to get in on this exciting action right now or in the future, then write to the FCC and make your feelings known.

The time for comments will be around the end of this year. Between now and then I encourage you to learn more about this exciting digital-communications mode. Visit a local "ham club" (your local Radio Shack store may be able to furnish a contact name), and ask if someone there can give you a demo. (Hams love to show off their stations.)

The American Radio Relay League filed a petition with the Federal Communications Commission asking that a new communicator class of amateur radio license be created. The FCC should issue a Notice of Proposed Rulemaking (NPRM) that will go up for public comment around the end of this year.

The ARRL board of directors chose to modify the recommendations of its own committee. The

board will request operating privileges limited to the 220-MHz amateur band and above, with a power limitation of 250 watts. The majority of local FM activity and digital packet radio occurs on the 144-MHz amateur band, which is not included in the proposal as it will be written. Of course the FCC is not obligated to stick with its recommendation, especially if public opinion seems to suggest something different. However, this proposed license is not a free ride. There will still be a significant written examination, as there's always been. Anyone can study and pass it, but it requires commitment. The major difference is you will no longer be required to learn Morse code, which many would-be ham operators view as outmoded and irrelevant.

If you believe the proposal should go through as stated, then say so. If you believe it's a bad idea and should be killed — state that too. If you believe it should be modified to include *all* current amateur privileges above 50 MHz, then go on record with that opinion. Such a change would include the 6-meter band that has occasional, spectacular openings to other parts of the world and the most popular 2-meter VHF band.

The message from me to you is twofold: If you care, comment — your message will count. In my opinion the FCC needs to hear not just from current amateurs but from potential users as well. You may not get another chance to voice your opinion — so do it now.

— Ed Juge  
Director of Market Planning,  
Tandy Corporation

*Steve Ford is an amateur radio operator and has his advanced-class license. He holds a bachelor's degree in English and also an associates degree in electronic engineering.*

cast band and extending all the way to microwaves. Moreover, amateur radio is dedicated to exploration and experimentation. Its ongoing goal is to find new ways to advance the state of electronic communication while at the same time offering assistance to the public in time of need.

There is something in amateur radio for just about everyone. If you like to communicate with people in distant states or countries, amateur radio is the perfect choice. A modest investment in equipment allows you to chat with other hams hundreds or thousands of miles away — without incurring hefty long-distance phone charges. And you aren't limited to just speaking. Hams can use other communication modes such as Morse code (known as CW or *Continuous Wave*), radio teletype (RTTY), television (SSTV or ATV), and even facsimile (fax), to name a few.

Most hams find a niche within the hobby. Some communicate across town while others bounce signals off the surface of the moon. Some hams exchange television images from a half a world away while others provide badly needed local communications in the midst of a crisis. There are even amateur radio satellites in orbit with sophisticated computer networks on the ground.

The question is: Where does the CoCo fit into all of this? The answer — everywhere!

### Color Computers and Amateur Radio

According to some recent surveys, up to 80 percent of the amateur radio operators in the United States own personal computers. While IBM, Commodore and Apple computers are the most popular, there are a number of hams who use Color Computers as well. These CoCos are usually involved directly in the communication activity itself, or they serve a peripheral role as data managers.

For example, CoCos have replaced the traditional telegraph key in some ham stations, making the task of sending and receiving Morse code much easier for the operator. Instead of tapping out the dots and dashes on a hand key, hams simply type the words from their keyboards and the CoCo operates the transmitter to send perfect code. In most cases this is accomplished through an interfacing device (sometimes called a *controller*) somewhat similar in function to a modem. In addition to sending code, the controllers can also receive code, translating the audio tones

from the receiver into characters you can see on the CoCo's screen. All that is needed for the CoCo is terminal software, the same software you would use to connect to Compuserve, Delphi or your local BBS.

Most of the interface devices on the market are multifunctional in nature. That is, they allow your CoCo to control several communications modes, not just CW. Many include RTTY, AMTOR (a form of error-free radio teletype), WEFAX (reception of weather map facsimile transmissions) and packet, which I'll discuss in a moment.

In some cases it is also possible to connect the CoCo directly to the station equipment without using an interface. In fact software is available that allows the CoCo to send and receive some modes by using the cassette port. However, this approach is not commonly used because of operating and performance limitations.

As data managers CoCos help hams keep detailed logs of stations they have contacted. They are particularly helpful during on-the-air contests where the goal is to communicate with as many different stations as possible. Specially written software keeps track of contest scores and weeds out duplicate loggings where a station has been contacted more than once. Some hams also use their CoCos to design and print QSL (contact verification) cards and compile mailing lists. Among the hams who use the amateur radio satellites, CoCos track orbital information to predict when a satellite is in the best position for contact.

With most of the amateur radio software written for the Commodore and IBM computers, ham radio software for the CoCo may be a bit difficult to locate. However, it is out there. There are several sources for Color Computer ham software, both public domain and commer-

cial. But if you're only interested in using the CoCo with interfacing devices, no special software is needed beyond a standard CoCo terminal program.

### The Special World Of Packet

A new and growing form of amateur radio communication has appeared on the scene in just the last several years. It is the closest thing yet to a perfect blending of the amateur radio and computing hobbies. This unique and fascinating mode is known as *packet*.

Packet is a form of linking between two computers that uses an amateur radio version of the well-known X.25 networking protocol. As the name implies, packet transmissions involve short bursts (packets) of data sent from one ham station to another. Some stations link directly; but in instances where this is not possible, packets are passed automatically between relaying stations until they reach their destinations. Once again interfacing devices (often referred to as terminal node controllers or TNCs) form the bridge between the computer and the



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other amateur station equipment.

Like the interfaces mentioned above, TNCs usually connect to the CoCo via the serial I/O port. Standard terminal software is all that is needed to communicate between the two. By communicating with the TNC, the CoCo user sets and adjusts certain operating parameters such as baud rate, date and time stamping, message logging, etc. In turn the TNC receives the incoming packets and displays them on the screen. The TNC also performs all the functions necessary to transmit and/or relay outgoing packets.

Packet enthusiasts exchange everything from simple messages to entire programs. There are even packet bulletin board systems (PBBS) that operate in much the same manner as telephone bulletin boards. The main difference is the lack of telephone lines since all communication is performed by radio.

Local area packet networks are appearing all across the country. Most of these operate on VHF frequencies where antennas are small and equipment is relatively cheap. If you have a programmable VHF police scanner, try setting it to 145.01 MHz. If you listen long enough, you may hear the brief, high-pitched buzzing sounds that are the trademarks of packet transmissions. If you have a TNC connected between your CoCo and the scanner's auxiliary speaker jack, you actually see packet messages scrolling across the screen.

Some hams, in the spirit of experimentation, have set up ultra-high-speed packet links on the UHF and microwave bands. These links connect several local area networks simultaneously, allowing packets to flow more easily between them. At the same time packet activity is also found on lower frequencies where atmospheric conditions permit long-range link-ups covering thousands of miles.

There are quite a few TNCs available for packet users. Some have software and interfacing specific for certain computers (usually IBM or Commodore), but there are also many models that are universally compatible. Some of the communication interfaces mentioned earlier include packet TNC functions as part of their design. Costs range from about \$140 for a basic TNC to almost \$400 for a deluxe all-mode TNC interface.

## Questions and Answers

By now you may be interested in exploring amateur radio, but perhaps you still have some lingering questions. Let's try to address some of the common ones here.

*Do you need a license to become an amateur radio operator?* Yes, you do. There are five license grades: novice, technician,

general, advanced and extra. As you progress from novice to extra, the tests become more difficult, but the privileges expand (more frequencies, more modes to use). This is not to say that you have to start at the novice level and work your way up over a period of months or years. If you can pass the test elements for the lower grades, you can get a license at any level right away.

*Are the license exams difficult?* The answer depends on the grade in question and your willingness to learn. All amateur radio license examinations require you to send and receive Morse code as well as pass a written test. At the novice level the tests are fairly easy. The code rate is a slow five words per minute. The written test covers basic electricity and the Federal Communications Commission law. The code speed gets higher and the written tests become tougher as you move up the ranks. For example, the technician, general and advanced licenses require that you send and receive code at 13 words per minute. Extra class requires code proficiency at 20 words per minute. While these code speeds are not overly difficult, they do present a challenge to some. The written tests also require a more in-depth knowledge of electronics, especially at the advanced and extra levels. Despite this I have seen people with little or no electronics education who have studied and passed the higher-level license tests. Dedication is the key.

*Who gives the tests?* The FCC recently changed the law affecting amateur license testing. Now qualified amateurs known as volunteer examiners can give the tests right in your home town. Your local ham club usually has a volunteer examiner among its members and may even offer classes to help you pass the tests.

*Is there a minimum age requirement?* No. Anyone can become a ham.

*Is ham equipment expensive?* It doesn't have to be. If you require the latest in full featured, high-tech equipment, you can expect to pay a fair amount for it. Much of the new amateur equipment available today is manufactured in Japan, and with the yen/dollar imbalance costs can be high. For example, a new transceiver for the short-wave frequencies can cost \$1000 or more. VHF equipment costs range from the low to high hundreds, depending on the item desired. However, it is important to point out that there is a great deal of used equipment very reasonably priced. With a little shopping in the classifieds and at ham radio flea markets, it is possible to find excellent equipment bargains for \$200 or less — sometimes much less. You can also build your own equipment, an activity that is truly in keeping with the spirit of the hobby. Depending on what you build and where

you find your parts, this can be a very cost effective and rewarding approach.

*Won't I need to put up huge antennas?* Not at all. Once again it all depends on your ambitions. As a general rule the higher the antenna the better the performance. That's why you see those large antennas mounted on high towers. But you don't need a big, high antenna to communicate. Some hams talk around the world using a single wire strung between two trees. I once had a fascinating conversation with a ham in Alaska using a crude wire antenna that dangled out of my second-story-apartment window. As mentioned previously, VHF packet doesn't require large antennas at all. I'm a very active "packeteer" in my area, and yet I only have a small antenna (basically a six-foot-long aluminum tube) strapped to a fence post in the back yard.

*How can I get more information?* That's the easiest question of all! There are at least three good sources:

- The American Radio Relay League, 225 Main Street, Newington, CT 06111, is an excellent starting point. This organization represents amateur radio interests in the United States and is very active in promoting the hobby. It has a large assortment of helpful materials to get you on your way. The phone number is (203) 666-1541.

- Your local amateur radio club. Amateur radio is so widespread that there are ham clubs in many locations. The American Radio Relay League can provide you with a list of clubs in your area. Check your newspapers as well. Some clubs publish their meeting times and they always welcome strangers. If you have a programmable police scanner, set it to scan the frequencies between 146 and 148 MHz. You may hear local club members talking to each other about upcoming meetings and events.

- If you have a modem, check the BBSS for Special Interest Groups (SIGs) that are dedicated to amateur radio. CompuServe, for example, has an active SIG known as *hamnet*. You'll find helpful hams in the SIGs and often a wealth of public-domain amateur radio software too.

It is also worth mentioning that Radio Shack sells a pre-packaged novice license training course (Cat. No. 62-2402) for about \$20. The package includes a study guide and cassette tapes to help you learn Morse code. If you can't attend a class in your area, this is a good alternative.

Amateur radio has a lot to offer the computer hobbyist. Beware, though — once it gets into your blood, it's a hard habit to shake. Most hams who join early stay hams for the rest of their lives. Once you take a good look at the hobby, you can see why.



# ★★★★★★ SCOREBOARD POINTERS ★★★★★★

In conjunction with THE RAINBOW's Scoreboard, we offer this bi-monthly column of pointers for game-playing readers' benefit. If you have some interesting hints, tips or responses to questions, or want help yourself, we encourage you to write to the Scoreboard, c/o THE RAINBOW.

In response to questions from:

● Clinton Morell: In *The Interbank Incident* give the medicine to the guy standing behind the desk at the hotel in Munich. If he has anything to tell you, he'll talk after taking a pill. As to what to do with the IBC shirt and the dice, you've got me. The computer is rather complicated. First you have to have the disk, the portable computer and the computer cartridge. Give the cartridge to the computer console in the museum. Next insert the disk into the portable computer, then give the portable computer to the console. The data should begin transferring to the computer and is stored on the disk.

What do you do with the ring?

● Jason Hanna: In *Dungeons of Daggorath*, keep either the fire ring or the ice ring without using it until you reach the wizard's image. Be sure your heartbeat has slowed down. You also need a Hale flask. Let the image come to you, then hit him once with the ring, run a few rooms away, use the Hale flask and wait for him to come at you again. Hit him once more with the ring and he should die. Then you are transported to Level 4.

● Brad Renfro: In *Dungeons of Daggorath*, to kill the bat you must have a ring. It can be just a gold ring. Hit him about 20 times repeatedly, run a few rooms away, then turn around and wait for him and attack again. It takes time but you'll get him.

Kill the wizard with an iron sword and bronze shield? You've got to be kidding — you need the elvish sword and the mithril shield. Wait for him to come to you, hit him once and run about 10 or 12 rooms away and turn around. This gives your heartbeat time to slow down. Then wait for him again.

Repeat the above steps. Done correctly, you kill him but it takes time.

Jason Jones  
Greenville, South Carolina

● David McCoy: In *Shenanigans* to convince the computer to open the trap door, type OPEN DOOR. Then you see the old cabin.

In *Vortex Factor*, how do you light up the caverns in the Cairo Moon? How do you open the safe in the first room?

Helder Santos  
Montreal, Quebec

● Steven Lipsraw: You can get out of Level 5 in *Thexder* by getting to the place where there is just one creature (called a *balder*) in a dead end and blasting the ceiling away until you get out to the passage above.

James Wilcox  
Epping, New Hampshire

Scoreboard:

I need help on *Martian Crypt*. How do I cross the open pit or the floor with cracks in the cave after I give the diamond to the Martian?

Eurik Perez  
New York

Scoreboard:

In *Interbank Incident* I know if you have two keys at the start in Seattle, you can go to the apartment building and use both keys to open the door. Does anyone know what the slot on the boat is for?

Robert Freeze  
Toledo, Ohio

Scoreboard:

In *Interbank Incident* I have the wallet but when I give it to anyone, the game stops. Why? I can't find the codebook or the thieves' hideout. Any other help

would be great, too. I also need help in the force field room in the master control center in *Robot Odyssey*.

Andy Schmidt  
Florence, Kentucky

Scoreboard:

I need help with *White Fire of Eternity*. I'm in a shrine honoring the dwarf miners. I see a statue, box, light, stone and pick. I tried to get the pick, but it's stuck in the statue's hands. Without a good grip I'm not able to pull it out. If you have any information regarding this, please write.

Harrison Feltner  
Happy, Kentucky

Scoreboard:

Has anyone played the game *Night of the Living Dead* by Savage Software? We have gone into the church and examined it carefully (we think) and then gone into the churchyard. There we always get killed by the zombie. We are beginning adventure game players, but it seems we should get farther than that. Can anyone help?

Thelma J. Saffold  
Austell, Georgia

To respond to others readers' inquiries and requests for assistance, reply to "Scoreboard Pointers" c/o THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We will share your reply with all "Scoreboard" readers in an upcoming issue. For greater convenience, "Scoreboard Pointers" and requests for assistance may also be sent to us through the MAIL, section of our Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type SEND and address to:EDITORS. Be sure to include your complete name and address.





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For greater convenience, your high scores may also be sent to us through the MAIL section of our Delphi CoCo SIG. From the CoCo SIG->prompt, pick MAIL, then type SEND and address to: EDITORS.

# THE OS-9 \*CART INTERRUPT FIX

*Solving the  
mysteries of  
OS-9 terminal  
problems*

By  
Marty  
Goodman

**C**oCo 3 OS-9 users with Multi-Pak Interfaces and RS-232 Paks occasionally find mysterious problems with OS-9 terminal programs locking up and refusing to receive more data. Restarting the terminal program, sometimes including use of the hardware Reset button, is required to resume operation.

Some experts have examined these problems and found that the problem is in the design of the Multi-Pak and the CoCo 3's GIME chip. It turns out that most, if not all, interrupt-related problems are solved by simple hardware modifications to the Multi-Pak and the Color Computer 3.

This article describes the Multi-Pak and CoCo 3 fixes and gives a detailed technical explanation of what is being fixed and why. The description of the Multi-Pak fix is brief. Tony DiStefano described a variant of that fix in the September '88 issue of THE RAINBOW in his "Turn of the Screw" column. The fix for the CoCo 3 is presented in detail to allow a hardware tinkerer of modest ability to make the needed modifications.

It is important to understand that these

*Martin H. Goodman, M. D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW'S CoCo SIG and database manager of OS-9 Online. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.*

fixes are primarily valuable for those using OS-9 and the RS-232 Pak. The fixes are probably not needed for other applications. Most Disk BASIC terminal programs do not use the interrupt on the RS-232 Pak. Thus these fixes are not valuable for them. *Ultimaterm* uses the interrupt and its users may find mysterious lockups are alleviated by making these fixes.

## General Background

Operating systems and other software are informed of events such as the arrival of data in the serial port through an *interrupt*. An interrupt is an electrical signal that tells the central processor to put other activities on hold and attend to the arrival of new data.

Although the Color Computer 1 was designed a long time ago, the designers provided for interrupts to be passed from the system bus (cartridge slot) or Multi-Pak slots to the 6809. However, the handling of this interrupt signal is not very sophisticated. Little thought appears to have been given to problems that might have arisen if interrupts were generated by multiple sources.

Instead of sending the interrupt directly to the 6809 (which would have been simple and direct), or adding a special interrupt handler chip designed to properly handle multiple interrupts, they provided for incoming interrupts to be processed by a PIA chip before being passed to the 6809. This is the \*CART interrupt, Pin 8 on the 40-pin CoCo system bus.

## Technical Background

When the Multi-Pak was designed, more complexity was added to the processing of \*CART interrupt signals. The Multi-Pak had provisions for switching through software which of the four slots were looked at by the computer for disk ROMs, I/O ports and \*CART signals.

The low-order two bits (bits 0 and 1) of the byte written to \$FF7F determines which of the four cartridge slots in the Multi-Pak is accepting signals from the \*SCS line (Input/Output addresses in the range of \$FF40 through \$FF5F used by the disk controller). Bits 4 and 5 control which slot the computer looks at to find a disk ROM (\*CTS line), and from which slot \*CART interrupts are accepted.

When OS-9 is running, the ACIA device driver must switch the slot selector to see if there are any interrupts pending from any of the cartridge slots. That is, the device driver must switch the Multi-Pak slot se-

lector for the \*CART line in order to detect the presence of an interrupt.

Sometimes an interrupt is generated and disappears before the Multi-Pak slot is selected to the device generating it, and it gets missed. Or two slots may be generating interrupts and, while processing one interrupt, the other pending interrupt fails to get serviced. If the interrupt that fails to get serviced is an RS-232 Pak interrupt, characters can be missed or — worse — the RS-232 Pak can lock up entirely. This problem is addressed by “strapping” the \*CART interrupt.

### Technical Explanation

When the Color Computer 3 was designed, even more complexity was added to the handling of the \*CART interrupt. In addition to the route from the cartridge slot to the CPU via the PIA chip, the GIME chip of the CoCo 3 was set up to receive the \*CART interrupt also and pass it to the IRQ interrupt on the 6809.

The normal way interrupts work on the 6809 is that the interrupt line is normally in a logic high (+5) level, and when the interrupt is activated, it is pulled to logic low (ground) level. The 6809 responds to the level (high or low) of the interrupt and recognizes the IRQ interrupt whenever it

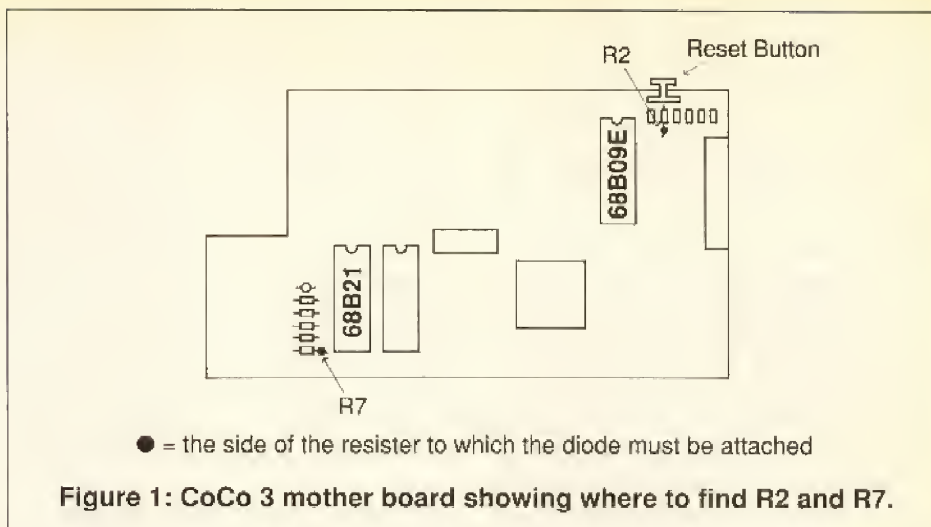


Figure 1: CoCo 3 mother board showing where to find R2 and R7.

sees its IRQ pin low. It keeps seeing the interrupt until the pin is high unless the interrupt is turned off by setting interrupt control flags inside the 6809 using the condition code register.

The designers of the GIME did not have the \*CART signal detected by its level. The GIME chip's \*CART interrupt input triggers on the transition from high to low of the interrupt line. What this means is that if one interrupt occurs very shortly after another, the GIME chip might never see the second interrupt because it is processing

the first one. By the time it starts looking for the second one, all it sees is the persistence of a low level on its interrupt line. Since it needs to see an actual transition on that pin, it fails to see the second interrupt.

This situation can easily occur under OS-9 if you are using a terminal program. The 60Hz clock inside the GIME is constantly “ticking,” generating 60 \*CART interrupts per second. At the same time the RS-232 Pak is receiving characters and generating a \*CART interrupt each time a character comes in. Sooner or later the

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| CUEING                           | YES        | NO        |
| ECHO DOUBLE/BACKWARDS            | YES/YES    | NO/NO     |
| ALL VARIABLES SAVED IN DISK FILE | YES        | NO!       |
| SOUND with SOUND                 | YES        | NO        |
| FULL TIME SUPPORT OF COCOS MODE  | YES        | NO        |
| PROGRAMMABLE PLAYBACK VOLUME     | YES        | NO        |

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interrupt generated by the RS-232 Pak occurs almost immediately after an interrupt generated by the internal 60Hz clock. The RS-232 Pak interrupt gets lost, resulting in lost characters or a lockup of the RS-232 Pak.

Making the GIME chip's \*CART interrupt input pin "edge-triggered" was a design mistake. This mistake was probably made because the PIA that handles the \*CART interrupt on the old CoCo 1 and 2 uses an edge-triggered input. The GIME chip designers decided to copy that, without thought to the fact that the 6809 itself uses a level-sensitive interrupt and the way OS-9 works. Due to some specific design decisions about the way OS-9's interrupt handling software was written, and the fact that OS-9 needs to use multiple sources for interrupts, a level-sensitive interrupt is more desirable. If the CoCo 3 had a special interrupt-handling chip to sort out multiple interrupts using dedicated hardware, there would not be a problem.

It is important to realize that various third-party manufacturers recommend this fix be used to cure a flaw in the basic design of the Color Computer 3's GIME chip.

Why would anyone want to use an edge-triggered input for an interrupt? The answer is that if you are only dealing with a single source of interrupts, edge-triggered interrupt inputs are best at detecting interrupts that occur for a very brief period of time. Level-sensitive interrupt handling is better for situations where more than one interrupt is used simultaneously and where the interrupt lines are left active (low) until they are serviced by the software.

### The Multi-Pak \*CART Hardware Fix

Before proceeding, it is important you keep in mind that opening your Multi-Pak or CoCo case voids any warranty currently in effect.

DiStefano recommends that OS-9 users "strap" the cartridge interrupt pins in their Multi-Paks. This involves opening the unit, removing the motherboard and turning it upside down. With the solder points for the four cartridge slots exposed, locate the spots where Pin 8 of each 40-pin female edge connector is soldered to the board. Run jumpers to each Pin 8, connecting all of them together. This fix may be done with either the old or new (Cat. No. 26-3024 or 26-3124, respectively) Multi-Pak Interfaces.

Some purists recommended cutting three of the four \*CART pull-up resistors in the Multi-Pak in addition to strapping the \*CART line. In the older Multi-Paks these are R11 through R14. In the newer, smaller Multi-Paks they are R3 through R6. If you do not cut three of the four pull-up resistors, there is a total resistance of over 1K, meaning less than 5 milliamps of current. It is

unlikely that this will cause any problem with most logic. However, if you want to be a purist, then cut out any three of the four resistors from your Multi-Pak.

After you strap the \*CART interrupt lines on your Multi-Pak, you are unable to use normal Radio Shack game cartridges in the Multi-Pak. If a game cartridge is in one of the slots, it causes the computer to crash. If you want to use your game cartridges, you need to cut the connection between Pin 8 and 9 on the game cartridge, select the slot with the modified game cartridge (using either the hardware switch on the Multi-Pak or a software poke), then type EXEC &HE010. The game then executes properly.

### The CoCo 3 \*CART Hardware Fix

Purchase a Schottky barrier diode from Radio Shack (Cat. No.276-1165). Note that virtually any physically small Schottky barrier diode will do. In a pinch you can use a germanium diode, such as a 1N34. The cathode is the lead nearest the band on the diode. The anode is the other lead.

Open the CoCo 3 and remove the case and keyboard. To remove the case and keyboard, grasp both sides of the plastic ribbon cable that attaches the keyboard to the keyboard ribbon cable socket and gently pull it out of the socket.

Now solder eight inches of insulated wire to each side of the Schottky diode. I recommend using 24- or 26-gauge stranded wire with black or green insulation soldered to the cathode of the diode (the side that has the stripe near it), and red or orange wire soldered to the anode of the diode. Insulate the diode using heat shrink tubing or electrical tape so none of the leads or solder joints between the diode and the wire are exposed. Be sure you know which wire leads to the anode and which leads to the cathode of the diode.

Locate R2 on your CoCo 3; this is a 4.7K ohm (yellow, violet and red) resistor in front of the Reset button of the computer. R2 is silk-screened in white on the circuit board behind the resistor. Solder the wire from the anode of the diode to the side of R3 that is toward the front of the computer (the side away from the Reset button).

Locate R7; this is also a 4.7K ohm (yellow, violet and red) resistor found just to the left of the 68B21 PIA chip. R7 is silk-screened in white just in front of this resistor. The 68B21 PIA chip is one of two 40-pin chips found to the left of the keyboard cable socket. Solder the wire from the cathode of the Schottky diode to the right side of R7 nearest the 68B21 chip.

The side of R7 that you soldered the cathode of the diode to is connected directly to Pin 8 of the 40-pin system bus socket. This is the incoming \*CART sig-

nal. The side of R2 you hooked the anode of the diode to connects directly to Pin 3 of the 68B09E, which is the IRQ pin of the 6809.

You have bypassed the internal GIME chip circuitry by routing the incoming \*CART line directly to the IRQ pin of the 68B09E. The diode is needed to make sure other interrupts (like the clock interrupt) are not fed backwards toward the \*CART line. This would cause the computer to think it had an auto-start ROM pak plugged in, and cause it to crash. I suggest you use a Schottky diode because of the very low (0.2 volt) voltage drop across its junction. A germanium diode (which has a 0.3 volt drop across its junction) is less desirable but OK. Do not use a normal silicon diode because the 0.6 volt drop across its junction is high enough to potentially cause problems with the logic. This fix allows an auto start ROM pak to work properly if plugged directly into the CoCo 3's cartridge slot. Of course if the CoCo 3 is being used with a Multi-Pak modified as described above, normal auto-start ROM packs will not work properly.

### Hacker's Historical Note

Old-time OS-9 hackers have used less elegant variants of this fix for several years. Typically they hard-wire the interrupt pin from the RS-232 Pak directly to the IRQ pin of the 6809. This modification requires an external wire running from the RS-232 Pak to the inside of the CoCo. Some sophisticated hackers eliminate the \*CART line entirely and, having freed up Pin 8 of the CoCo's system bus, use that to pass the interrupt from the RS-232 Pak to the 6809's IRQ pin. These hacks work and nicely cure the GIME chip's interrupt-handling problem. But they are more difficult to use than the diode modification described above. The diode modification has been used quite extensively and works just as well as the more complicated internal CoCo 3 \*CART modifications.

### Acknowledgements

Special thanks are due Roger Krupski of RGB Systems (creator of the software for the RGB hard drive system) for his extensive help in explaining the diode modification to me. Roger is the originator of this elegant fix. Thanks, too, to Bruce Isted (designer of the Frank Hogg Labs deluxe hard drive system and the eliminator pack) for his comments on both Roger's fix and on some of the other \*CART hacks. And thanks to Greg Law, SysOp on the Delphi OS-9 SIG, and Tim Koonce, author of *VTERM* and database manager on the Delphi CoCo SIG, who helped explain various technical subtleties. ☺

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## Pyramix

This fascinating CoCo 3 game continues to be one of our best sellers. *Pyramix* is 100% machine language written exclusively to take advantage of all the power in your 128K CoCo 3. The Colors are brilliant, the graphics sharp, the action fast. Written by Jordan Tsvetkoff and a product of ColorVenture.

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I've got to admit, this is one nifty computer program. *Vocal Freedom* turns your computer into a digital voice recorder. The optional *Hacker's Pac* lets you incorporate voices or sounds that you record into your own BASIC or ML programs. This is not a synthesizer. Sounds are digitized directly into computer memory so that voices or sound effects sound very natural. One "off-the-shelf" application for *Vocal Freedom* is an *automatic message minder*. Record a message for your family into memory. Set *Vocal Freedom* on automatic. When *Vocal Freedom* "hears" any noise in the room, it plays the pre-recorded message! Disk operations are supported. VF also tests memory to take advantage of from 64K up to a full 512K. Requires low cost amplifier (RS cat. #277-1008) and any microphone.

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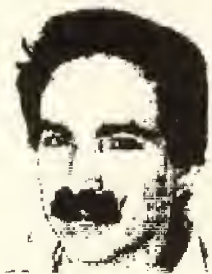
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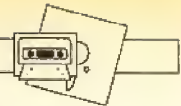
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If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. Remember, keep your ideas specific, and don't forget this is BASIC. All programs resulting from your wishes are for your use, but remain the property of the author.

Last month I took a break from a long series of educational programs by revamping an old BASIC graphics game I wrote when the CoCo first came out: *Meteor Storm*. Those of you who have entered that listing or loaded it from your RAINBOW ON TAPE or DISK should have gotten a few hours of fun out of the new, improved version.

As a follow-up to that effort, I decided to take another stab at another old chestnut that has been out of circulation for many years, a program I wrote called *Star Siege*. Not to be outdone by its older brother *Meteor Storm*, *Star Siege 2* has taken on a whole new look and added an element which the original never had, and which no BASIC graphics CoCo game has ever attempted: a moving star field.

**The Original Version**

When I first wrote *Star Siege 1*, it was designed as a two-player game. Two differently shaped vehicles would race around the screen and fire laser bolts at each other. However, since the listing was very long, the program was very slow, even with the high-speed poke. Instead of being a real arcade-style game, it was more like a game of chess. You had to use a little strategy to move around the screen with your joystick. You also needed someone else to play the game with you.

**New and Improved**

I have learned quite a few shortcuts since the original version of this game came out. (Still, this is the first public listing of the game in a magazine. Unfortunately the original made a heavy tour on the piracy route.)

Since a different view of each ship is

*Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.*

*Innovative renovation*

# Machine Language Tricks from a BASIC Game: Star Siege II

By Fred B. Scerbo  
Rainbow Contributing Editor

drawn depending on the direction in which your joystick is pointed, the original listing had a lengthy set of IF...THEN statements to determine which view of the ship was drawn.

The listing shown here uses a totally different approach to this problem. Using fewer IF...THEN statements, lines 110 to 150 do the job. This time I used a multi-dimensional array S\$(3,3) to control the nine views of the ship(s). By reading the joystick values and setting them into three possible outcomes, I could much more rapidly select a direction and view for the ship.

For example, in our 3-by-3 array, S\$(2,1) would show the ship pointing straight up. S\$(2,3) would be directly down. Get the idea?

Another big change was switching from PMODE4 to PMODE0 and using the PCLEAR8 command. I have gone into great detail in previous articles about why I prefer using the lower-resolution graphic pages. In this case the increase in speed and number of graphic pages more than outweighs the loss of the artifact colors in the star field background.

Using PCOPY, we are also able to completely eliminate the flicker that the animation in the original *Star Siege* suffered from. We no longer need to undraw each

|     |       |     |     |       |     |
|-----|-------|-----|-----|-------|-----|
| 40  | ..... | 243 | 280 | ..... | 60  |
| 75  | ..... | 146 | 325 | ..... | 68  |
| 95  | ..... | 66  | 390 | ..... | 88  |
| 120 | ..... | 146 | 450 | ..... | 123 |
| 200 | ..... | 30  | END | ..... | 101 |

**The listing: SIEGE2**

```

1 REM*****
2 REM* STAR SIEGE TWO *
3 REM* BY FRED B.SCERBO *
4 REM* COPYRIGHT (C) 1989 *
5 REM* 60 HARDING AVE *
6 REM* NORTH ADAMS,MA 01247 *
7 REM*****
8 PCLEAR8
9 CLEAR1000:CLS0
10 PRINTSTRING$(32,188)::FORI=1T
O200:READA:PRINTCHR$(A+128)::NEX
T
15 DATA110,108,108,106,110,109,1
08,106,110,108,109,110,108,109,
37,44,44,45,36,46,37,44,44,42,46
,44,45,37,44,44,45
20 DATA106,...104,101..104,106,,
101,,106,,101,37,32,...,42,37,...
42,,32,37,..
25 DATA108,108,108,106,,101,..,11
0,108,109,,110,109,108,36,44,44,
45,,42,37,44,40,,42,32,45,37,44,
40.
30 DATA...106..101...106..101..1
06,101,..,32,,37,,42,37,32,..,42,..
37,37,..
35 DATA98,..106,,101,..,106,,101,
,106,101,..,33,..,37,,42,37,..,34,42
,..,37,37,,32,33
40 DATA108,108,108,104,,108,104,
100,108,,108,104,104,100,108,36,
44,44,44,36,44,36,44,44,40,44,44
,44,36,44,44,44
45 DATA124,124,124,124,124,124,1
24,124,96,76,76,77,76,76,74,74,6
4,66,64,74,78,76,76,74,116,124,1
24,124,124,124,124,124
50 DATA124,124,124,124,124,124,1
24,124,..,69,64,..,74,,74,,74,74,
,,74,116,124,124,124,124,124,124
,124
55 DATA124,124,124,124,124,124,1
24,124,..,76,72,,64,76,76,76,76,
72,76,76,76,72,116,124,124,124,1
24,124,124,124
60 PRINTSTRING$(32,188);
65 PRINT@389." GRAPHIC SPACE BAT
TLE "":PRINT@421." BY FRED B. S

```

ship. We simply use a clean graphic page and PCOPY it to the one we are looking at.

In our layout pages 3 through 8 have random star fields. We PCOPY one of these pages to Page 2, do our drawing, and then PCOPY Page 2 to Page 1 where we do all our watching.

By having six pages reserved for star fields, each one a random field, we get a moving starfield by selectively using a different page for each drawing. This can be found in lines 285 to 290.

Not bad for BASIC, eh?

### Using the Game

If you really want to have fun with this game, add the high-speed poke to Line 8 so it reads:

```
8 PCLEAR8:POKE65495,0
```

for CoCo 1 or 2, or:

```
8 PCLEAR8:POKE65497,0
```

for a CoCo 3.

Be sure to save the program before you run it. With the CoCo 3 high speed poke the game really zips, but it might do weird

```
CERBO ";;PRINT@453." COPYRIGHT
(C) 1989 ";
70 PRINT@485." ENTER LEVEL (1-
2) ";
75 V$="D2RNURNU2BR2NU2BR2U2F2NU2
BR2U2F2U2BR2NR2DNRDR2BR2U2R2DLNF
R":D$="D2R2NUBR2NR2U2R2D2BR2R2III
2UR2BR2NR2DNRDR2BR2U2R2DLNFL":NO
$="U2F2U2C0RC5R2D2L2U2"
80 C0$="R3NDL3D4R5U4R3D2L3RF2RU3
ERFDNL3D2R3EUL3UER3D4U2R3U2D4":H
0$="U5RD2R2U2RD5NLBRU5RD5NLBR3U4
L2UR5DL2D4LBL6U2L2D2L":PF$="NL3N
R3U2DLGFR2EHLGFHE":DIMA(21):FORI
-12T0240STEP12:A(I/12)-I:NEXT:DI
MB(14):FORI-12T0156STEP12:B(I/12
)-I:NEXT:B(13)-152
85 A(21)-A(20):B(14)-B(13):IIR-12
4:CR=256:K=126:L=71:S$(2,1)="U4G
D3G2DRDR4URUH2U3HD6LNGR2F":S$(2,
3)="D4EU3E2ULUL4DLDF2D3FU6RNE2H
":S$(3,2)="R4HL3H2LDLD4RDRE2R3EL
6UNHD2G":S$(1,2)="L4FR3F2RURU4LU
LG2L3GR6DNFU2E":S$(1,1)="F4ND2NR
2H4DF2D3FFEREUEHL3H2L"
90 S$(3,1)="G4NL2ND2E4LG2L3GFDFR
FEU3E2U":S$(3,3)="H4NU2NL2F4UH2U
3HGLGDGRF3F2R":S$(1,3)="E4NR2NU2
G4RE2R3EHUHLHG3G2D":A$(2,1)="-G
NU4ND2GNU2GDREFENU6FRUHNNU2H2NENH
":A$(3,2)="HNR4NL2HNR2HLDFGFNR6G
DREN2E2NFNE":A$(2,3)="END4NU2EN
D2EULGHGND6HLDFND2F2NGFN"
95 A$(1,2)="FNL4NR2FNL2FRUHEHNL6
EULGNL2G2NHNG":A$(3,1)="-LNE2NG2L
```

```
2NELGFRDRDFEUNEU2NG2NE2UNRNU":A$(
3,3)="-UNF2NH2U2NFUHGDLGLGFRNFR2
NH2NF2RNDNR":A$(1,3)="-RNG2NE2R2N
GREHLULUHGDNGD2NE2NG2DNLND":A$(1
,1)="-DNH2NF2D2NHDFEURUREHLNL2NF
2NH2LNUNL"
100 EX$="NU2ND2NR2NL2NENFNGNH":T
C$="UR3UL3U3R15D3LDRDL2U2LU2R2DL
2D3LU4LD4LU2U2LDRDL2LU4LD4LU4L4
DR3D3L4":TD$="UR3UL3U3R4DL3DR3D2
RU4RD4RU4R3DL2DRDLDR3U4R4DL3D3R2
ULUR2D2RU4R3DL2DRDLDR2DL19":SJ$=
SD$:AJ$=AD$:S$(2,2)-S$(1,2):A$(2
,2)=A$(1,2):GOTO100
105 PMODE0,1:SCREEN1,0:SOUNDRND(
210),1:SCREEN1,1:SOUNDRND(210),1
::PMODE0,1:SCREEN1,1:RETURN
110 A=1:KK$=K$:LL$=L$:SP$=SS$:X=
JOYSTK(0):Y=JOYSTK(1):P1=0:R1=0:
IFX<20THENP1=(-A)ELSEIFX>40THENP
1=(+A)
115 IFY<21THENR1=(-A)ELSEIFY>42T
HENR1=(+A)
120 K=K+P1:L=L+R1:GOSUB125:GOTO1
40
125 IFK<1THENK=20 ELSE IF K>20TH
ENK=1
130 IFL<1THENL=13ELSEIFL>13THENL
=1
135 RETURN
140 X=INT(X/21)+1:Y=INT(Y/21)+1:
IFX=4THENX=3
145 IFY=4THENY=3
150 GOSUB510:K$=STR$(A(K)):L$=ST
R$(B(L)):RETURN
```

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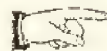
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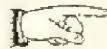


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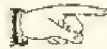


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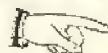
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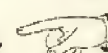
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things to your machine.

Running the program gives you a new title card. You have two difficulty levels, 1 and 2. One is a simple game; Level 2 includes a mystery ship that zaps both you and your opponent.

The Shuttle-like vehicle shown at the bottom left of the score screen is yours. The one on the right looking like an insect belongs to the computer. The game is now a one player game and you must use your right joystick. Simply fly around the screen and zap your opponent before he zaps you. You will quickly learn that flying directly above or below your opponent can be dangerous. Be careful not to crash into each other. You can have some close calls that look like collisions, but a direct hit will zap you both.

Each side can take ten hits. The first one



Figure 1

hit ten times is the loser. Believe me, it is not as simple as it sounds. Even without the high-speed poke, the game does move quite nicely, and I think you will like the moving star field.

### Conclusion

Take a close look at the listing and you will see there are a lot of GOSUBS that I did not eliminate from the original. I did not want to make this job too big, and quite frankly I do not remember why I did some things certain ways. If you do check the lines I mentioned, you may get some programming ideas of your own. Give it a shot.

Next month we return to some more serious business. Until then, let me know how you like these two new versions of older games and whether or not you would like to see more of the same.

```

155 TS=TS+1:IFTS>5THEN TS=0:A=1:
W=RND(3):Z=RND(3):P2=0:R2=0:IFW=
1THENP2=(-A)ELSEIFW=3THENP2=(+A)
160 IFZ=1THENR2=(-A)ELSEIFZ=3THE
NR2=(+A)
165 M=M+P2:N=N+R2:IFM<1THENM=20E
LSEIFM>20THENM=1
170 IF N<1THEN N=13ELSEIF N>13TH
EN N=1
175 GOSUB500:M$=STR$(A(M)):N$=ST
R$(B(N)):RETURN
180 IN$=INKEY$
185 IF IN$="1"THEN200
190 IF IN$="2"THEN205
195 GOTO180
200 R3=1:SD$=SJ$:AD$=AJ$:GOTO210
205 R3=12:SD$=SJ$:AD$=AJ$:GOTO21
0
210 CLS0:REM START GAME
215 SOUND220,3:SOUND110,3:SOUND1
,3:PMODE0,1:PCLS0:SCREEN0,1
220 LINE(0,168)-(256,192),PSET,B
F:LINE(24,188)-(124,174),PRESET,
BF:LINE(154,188)-(256,174),PRESE
T,BF:DRAW"S8BM12,180C0"+S$(1,2):
DRAW"S9BM138,180C0"+A$(1,2)
225 FORQ=29T0119STEP10
230 CIRCLE(Q,181),3,5,1.3
235 NEXTQ
240 FORQ=159T0249STEP10
245 CIRCLE(Q,181),3,5,1.3
250 NEXTQ
255 FOREP=2T08:PCOPY1T0 EP:NEXTE
P:FOREP=3T08:PRINT@258," STAND B
Y FOR COUNTDOWN: ";10-EP::PMODE0
,EP:FORQ=1T0110
260 PSET(RND(256),RND(148),5)
265 NFXTQ:SOUND1,1:NEXTEP
270 FP=2:K=3:L=9:M=17:N=4:PCOPY1
T02:TS=5
275 GOSUB110:GOSUB155
280 PMODE0,1:SCREEN1,1:IFHR<=24A
NDCR<=156THEN490ELSEIFHR<=24THEN
470ELSEIFCR<=156THEN480
285 FP=FP+1:IF FP>8THEN FP=3
290 PCOPY FP T02:PMODE0,2:GOSUB4
50:S1=0:S2=0:HT=0:CT=0:GOSUB110:
DRAW"S8BM"+K$+",""+L$+"C5"+S$(X,Y
):IFK=M AND L=N THENGOSUB460
295 GOSUB155:DRAW"S9BM"+M$+",""+N
$+"C5"+A$(W,Z):PCOPY2T01:PMODE0,
1:IFK=M AND L=N THEN GOSUB460
300 PA=RND(R3):IFPA<10THEN325
305 PB=RND(6):PC=RND(230)+16:PD=
RND(136)+10:PC$=STR$(PC):PD$=STR
$(PD):DRAW"S12BM"+PC$+",""+PD$+"C
5"+PF$:SOUND120,2:IFPB<5THEN310E
LSEIFPB=5THEN315ELSEIFPB=6THEN32
0
310 DRAW"S12BM"+PC$+",""+PD$+"C0"
+PF$:DRAW"S1BM10,10C5U":GOTO325
315 LINE(PC,PD)-(A(M),B(N)),PSET
:SOUND120,1:LINE-(PC,PD),PRESET:
DRAW"S12BM"+PC$+",""+PD$+"C0"+PF$
:DRAW"S1BM10,10C5U":GOSUB370:GOT
0280
320 LINE(PC,PD)-(A(K),B(L)),PSET
:SOUND120,1:LINE-(PC,PD),PRESET:
DRAW"S12BM"+PC$+",""+PD$+"C0"+PF$
:GOSUB375:GOTO280
325 S1=PEEK(339)
330 IFX=2ANDY=2THEN335ELSEIFS1=2
54THEN385
335 IF M=K THEN420
340 IFHT=0ANDCT=0THEN280
345 IFHT=1THENGOSUB370
350 IFCT=1THENGOSUB375
355 GOTO280
360 GOSUB365:GOSUB440:GOSUB445:G
OTO280
365 DRAW"S40BM26,60C5"+C0$:DRAW"
S40BM"+K$+",""+L$+"C5"+EX$:DRAW"S
40BM"+M$+",""+N$+"C5"+EX$:PCOPY2T
01:GOSUB105:N=4:K=3:L=9:M=17:RET
URN
370 DRAW"S48BM50,120C5"+H0$:DRAW
"S32BM"+M$+",""+N$+"C5"+EX$:PCOPY
2T01:GOSUB105:GOSUB105:M=17:N=4:
GOSUB445:HT=0:RETURN
375 DRAW"S48BM50,120C5"+H0$:DRAW
"S32BM"+K$+",""+L$+"C5"+EX$:PCOPY
2T01:GOSUB105:GOSUB105:K=3:L=9:G
OSUB440:CT=0:RETURN
380 GOTO290
385 HT=0:K1=K:L1=L
390 K1=K1+P1:L1=L1+R1:IFX=2ANDY=
2THEN405ELSEIFK1=M AND L1=N THEN
405:GOSUB510
395 IFK1<=1THEN405ELSEIFK1=>20TH
EN405ELSEIFL1<=1THEN405ELSEIFL1=
>13THEN405
400 GOTO390
405 GOSUB510:LINE(A(K),B(L))-(A(K
1),B(L1)),PSET:SOUND220,1:LINE-
(A(K),B(L)),PRESET:CIRCLE(A(K1),
B(L1)),2,5:CIRCLE(A(K1),B(L1)),2
,0:IFK1=M AND L1=N THEN415
410 GOTO335
415 SOUND10,2:HT=1:GOTO335
420 CT=0:M1=M:N1=N
425 REM YOU ARE HIT
430 GOSUB500:LINE(A(M),B(N))-(A(K
),B(L)),PSET:SOUND190,1:LINE-(A
(M),B(N)),PRESET:CIRCLE(A(M1),B(
N1)),2,5:CIRCLE(A(M1),B(N1)),2,0
435 SOUND50,2:CT=1:GOTO340
440 HR=HR+10:FOREP=3T08:PMODE0,E
P:LINE(124,174)-(HR,188),PRESET,
BF:NEXTEP:SOUND175,1:RETURN
445 CR=CR+10:FOREP=3T08:PMODE0,E
P:LINE(256,188)-(CR,174),PRESET,
BF:NEXTEP:SOUND175,1:RETURN
450 IFK=M AND L=N THENGOSUB460
455 RETURN
460 GOSUB365:GOSUB440:GOSUB445
465 RETURN
470 DRAW"S16BM26,156C5"+D$:DRAW"
BM156,156"+V$:GOSUB105:GOSUB105:
GOSUB105:RW=RW+1:FORI=1T02500:NE
XT
475 GOTO495
480 DRAW"S16BM26,156C5"+V$:DRAW"
BM156,156"+D$:GOSUB105:GOSUB105:
GOSUB105:LW=LW+1:FORI=1T02500:NE
XT
485 GOTO495
490 DRAW"S56BM86,72C5"+N0$:DRAW"
S48BM40,84C5"+V$:GOSUB105:GOSUB1
05:GOSUB105:FORI=1T02500:NEXT
495 X$=INKEY$:IFX$<>CHR$(13)THEN
495ELSERUN
500 IFM1<=1THENM1=1ELSEIFM1=>20T
HENM1=20ELSEIF N1<=1THEN N1=1ELS
EIF N1=>13THENN1=13
505 RETURN
510 IFK1<=1THENK1=1ELSEIFK1=>20T
HENK1=20ELSEIF N1<=1THEN N1=1ELS
EIF N1=>13 THEN N1=13
515 RETURN

```



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*For photo albums that are pretty as a picture*

# Captivating Captions

by Kevin Reichert

While sorting through photos of my recent vacation and trying to find an organized way of placing them in an album, I got the idea for *Captivating Captions*. It is a program designed for the 128K CoCo 3 tape- or disk-based system and requires a printer.

If your system encounters problems when using the speed-up poke, you can change Line 2290 to 2290 RETURN. This subroutine slows the computer down while printing and speeds it up when printing is finished.

The printer used in conjunction with this program is the Star NX-1000 Rainbow. But with minor adjustments you can modify the following lines for compatibility with your printer. The control codes in K\$(1) and K\$(2) in lines 2050 and 2060 respectively are the characters for the top and bottom borders of the caption's frame. In Line 600 C\$(1) holds the left side of the frame, a line of text, and the right side of the frame. The 1 in Line 15's statement POKF 150,1 tells the computer to print data at 9600 baud. You should consult your manual to find the value that coincides with your printer's baud rate.

*Kevin Reichert has a degree in computer information processing from Southern Illinois University-Carbondale. He is knowledgeable in seven languages and worked with the NEC system and university students while in Japan. He enjoys playing the synthesizer and incorporating graphics into plain programs.*

To use *Captivating Captions* simply type in the listing, save a copy on disk or tape, and run it. Following the title screen and the program outline, you are asked to either enter a caption or press ENTER to see a sample caption. Once you have done this, the caption is framed at the top of the screen while the menu is displayed at the bottom. Entering a number 1 through 36 causes the caption to be displayed containing the number of characters per line as you have selected. Entering a 1 instructs the computer to display the caption at its smallest possible width. To print your caption, press P. As a safety precaution you are asked once more to press either ENTER to print or M to return to the menu.

After you have printed your captions, you can cut them out and place them under, over or beside the photos in your album or even on the back of the photos themselves. Pressing T in the main menu allows you to enter and manipulate a new caption. When you are ready to quit, press the Q key.

Not only does this program pro-

vide a stylish way of labeling photos and other items, but it also provides some unique subroutines that can be modified to incorporate into your own programs. Please feel free to send me your modifications and enhancements.

*(Questions or comments concerning this article may be addressed to the author at P.O. Box 103, Grand Chain, IL 62941-0103. Please enclose an SASE when requesting a reply.)*



|                                     |            |     |            |     |
|-------------------------------------|------------|-----|------------|-----|
| <input checked="" type="checkbox"/> | 24Ø .....  | 7   | 157Ø ..... | 236 |
|                                     | 50Ø .....  | 138 | 182Ø ..... | 109 |
|                                     | 79Ø .....  | 248 | 208Ø ..... | 46  |
|                                     | 106Ø ..... | 209 | 226Ø ..... | 89  |
|                                     | 128Ø ..... | 109 | END .....  | 17  |

The listing: CAPTION

```
Ø ' COPYRIGHT 1989 FALSOFT, INC
1Ø '*****
2Ø '** CAPTIVATING CAPTIONS **
3Ø '** COPYRIGHT (C) 1989 **
4Ø '** BY KEVIN REICHERT **
5Ø '*****
6Ø '
7Ø '*****
8Ø '** SET-UP **
9Ø '*****
10Ø ON BRK GOTO 11Ø: GOTO 12Ø
```

# XTEAM & OS-9

## XTERM

- OS-9 Communications program
- Menu oriented
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Perform economic analysis to compare different cost and income alternatives! Compute present and future Life Cycle Worths for various combinations of single, series and gradient dollar amounts. Quickly edit and recompute for sensitivity analysis! Display line graphs. Printout data and results. Pull-down menus, windows and prompts. Requires os-9 level II and Basic09.

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\*Software by ColorVenture

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### ACCOUNTS PAYABLE

Designed for the maintenance of vendor and A/P Invoice files. The system prints checks, voids checks, cancels checks, deletes cancelled checks, and deletes paid A/P Invoices. The user can run a Vendor List, Vendor Status report, Vendor Aged report, and an A/P Check Register. This package can be used either as a standalone A/P system or can be integrated with the Small Business Accounting Package.

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```

110 WIDTH 40:ATTR 2,1:POKE 65496
,0:PRINT"PROGRAM TERMINATED":END
120 GOSUB 2290 '-=<SPEED UP POKE
>=
130 GOSUB 1460 '-=<TITLE PAGE>=
.
140 LOCATE 10,9:PRINT"ONE MOMENT
PLEASE":LOCATE 1,22
150 CLEAR 6000:DIM X$(6,37),X(6,
37),C$(30),K$(30),A(30),S$(30),O
C$(30)
155 POKE 150,1 '-=<9600 BAUD>=-
160 KE$="This is an example of w
hat your caption might look like
. Alter the characters per line
by entering various values."
170 R=-1:KK=0:YY=5
180 X$=STRING$(16,32)+"CHOICES"+
STRING$(14,32):GOSUB 260
190 X$=STRING$(6,32)+"(1-36)=CHA
RACTERS PER LINE"+STRING$(5,32):
GOSUB 260
200 X$=SIRING$(9,32)+"(1)=SMALLE
ST WIDTH"+STRING$(10,32):GOSUB 2
60
210 X$=STRING$(9,32)+"(P)=SEND T
O PRINTER"+STRING$(9,32):GOSUB 2
60

```

```

220 X$=STRING$(9,32)+"(T)=TYPE N
EW CAPTION"+STRING$(8,32):GOSUB
260
230 X$=STRING$(9,32)+"(Q)=QUIT P
ROGRAM"+STRING$(12,32):GOSUB 260
240 Y(1)=5
250 GOTO 360
260 R=R*-1:KK=KK+1:YY=YY+1
270 FOR T = 1 TO 37
280 IF R=1 THEN X(KK,T)=38-T:X$(
KK,T)=LEFT$(X$,T)
290 IF R=-1 THEN X(KK,T)=1:X$(KK,
T)=RIGHT$(X$,T)
300 Y(KK)-YY
310 NEXT T
320 RETURN
330 *****
340 ** GET CAPTION **
350 *****
360 LOCATE 10,1:PRINT"INPUT ENTI
RE CAPTION"
370 LOCATE 39,1:ATTR5,5:PRINT ST
RING$(41," ");
380 LOCATE 0,3:ATTR 1,1:PRINT ST
RING$(239," ");LOCATE 0,9:ATTR
5,5:PRINT STRING$(39," ");
390 LOCATE 6,14:ATTR 2,1:PRINT"P
RESS <ENTER> TO SEE SAMPLE":LOC
ATE 19,16:PRINT"OR":LOCATE 9,18
:PRINT"TYPE YOUR OWN CAPTION.":
LOCATE 0,3
400 LINE INPUT C$
410 IF C$="" THEN C$=KE$
420 GOSUB 1300
430 IF LEN(C$)<35 THEN L=LEN(C$)
+2:GOSUB 1130 ELSE L=36:GOSUB 1
130
440 GOSUB 550
450 TB=19-INT(LEN(S$(1))/2)-1:L=
LEN(S$(1)):IF TB<0 THEN TB=0
460 FOR T = 0 TO F+2:LOCATE 0,T:
ATTR 0,0:PRINTSTRING$(39," "):N
EXT T
470 FOR T = 0 TO F+1:LOCATE TB,T
:ATTR 6,6:PRINTSTRING$(L+2," ");
480 NEXT T
490 LOCATE TB+1,1:ATTR 2,1
500 IF F<5 THEN RN=1 ELSE RN=2
510 ON RN GOTO 680,770
520 *****
530 ** CENTER TEXT **
540 *****
550 KS=INT(L/2+.5)
560 FOR I=1 TO F
570 A(I)=KS-INT(LEN(C$(I))/2)
580 IF INT(LEN(C$(I))/2) <> LEN(
C$(I))/2 THEN C$(I)=C$(I)+" ":GO
10 570
590 S$(I)=" "+STRING$(A(I)," ")+
C$(I)+STRING$(A(I)," ")
600 C$(I)=CHR$(179)+" "+STRING$(
A(I)," ")+C$(I)+STRING$(A(I)," "
)+CHR$(179)

```

## MLBASIC 2.0 - BASIC Compiler

If you want your BASIC programs to run up to 60 times faster, or want more programming features without learning another language, MLBASIC is for you. MLBASIC is the most compatible BASIC compiler available for the Color Computer. WHY? Because MLBASIC fully supports:

- Low- and high-resolution graphics
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- All available commands offered with BASIC
- Floating point functions and expressions
- Integer, floating point and string type variables and arrays
- Use of all available 618K RAM in the COCO 3
  - 80,40 or 32 column text displays

MLBASIC not only contains everything that you would expect a BASIC programming language should contain, MLBASIC has features that offer flexibility of other languages like C, Pascal, FORTRAN and even assembly language. These features will allow programmers to directly access the CPU registers on the COCO, produce modular program code with SUBROUTINES, manipulate memory in blocks, and even call ROM routines in other areas of memory.

MLBASIC revision 2.0 has incorporated all enhancements that were suggested by MLBASIC 1.0 users and more. Revision 2.0 did away with all the incompatibility problems that existed with revision 1.0.

MLBASIC allows for the first time user to quickly compile a program using default compiler settings. The advanced user has the capability of controlling over a dozen settings which control where the program is compiled, which medium to compile to (memory or disk), string space, compiler listings and more.

With all this going for MLBASIC, your might expect the cost to be a little out of your budget. After looking at prices of other BASIC compilers for the COCO 3 you might be correct. But look again at this ad; for only \$69.95, you can have a programming language that will spark your interest once again in the COCO.

Before you buy another BASIC compiler for the COCO, find out if it supports everything MLBASIC supports. Then look at the price tag. We feel that it won't be long before you place an order for MLBASIC.

*"MLBASIC is a fine program for any serious programmer,"*  
said David Gerald in the December 1987 RAINBOW.

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```

610 NEXT I
620 LOCATE 10,10:PRINT STRING$(2
4,32);:LOCATE 1,22
630 RETURN
640 *****
650 ** PRINT SCREEN **
660 ** LEFT TO RIGHT **
670 *****
680 FOR S=1 TO LEN(S$(1))
690 FOR T=1 TO F
700 LOCATE TB+S,T
710 PRINT MID$(S$(T),S,1);
720 NEXT T,S:GOTO 870
730 *****
740 ** PRINT SCREEN **
750 ** SIDE TO SIDE **
760 *****
770 RR=1:J=LEN(S$(1))
780 FOR T=1 TO F: RR=RR*-1
790 IF RR=1 THEN FOR S=1 TO J
800 IF RR=-1 THEN FOR S=J TO 1 S
TEP -2
810 LOCATE TB+S,T
820 IF RR=1 THEN PRINT MID$(S$(T
),S,1); ELSE PRINT MID$(S$(T),S,
J-S+1);
830 NEXT S,T
840 *****
850 ** MENU **
860 *****
870 LOCATE 0,F+3
880 ATTR 5,5:PRINT STRING$(40,"
");:LOCATE 17,F+5:ATTR 2,1
890 FOR S=1 TO 6
900 FOR T=1 TO 37
910 LOCATE X(S,T),F+Y(S)
920 PRINT X$(S,T);
930 NEXT T,S
940 P=0:LOCATE 39,F+12:ATTR 5,5:
PRINT " ";
950 LOCATE 20,F+12:ATTR 2,1:PRIN
T " ";
960 LOCATE 20,F+12:ATTR 2,1
970 LINE INPUT P$
980 IF P$="P" THEN 2040
990 IF P$="T" THEN GOSUB 1310:GO
TO 360
1000 IF P$="Q" THEN GOTO 110
1010 IF P$="" THEN GOTO 940
1020 P=VAL(P$)
1030 IF P<1 OR P>36 THEN GOTO 94
0
1040 GOSUB 1300
1050 G=0:W=0:FOR Q=1 TO LEN(C$):
W=W+1:IFMID$(C$,Q,1)=" "THEN 106
0 ELSE NEXTQ:IFW>G THEN G=W:GOTO
1070 ELSE GOTO 1070
1060 IF W>G THEN G=W:W=0:NEXT Q
ELSE W=0: NEXT Q
1070 IF P>G THEN 1080 ELSE P=G
1080 L=P:GOSUB 1300:GOSUB 1130:G
OTO 440
1090 GOSUB 1300:RETURN

```

```

1100 *****
1110 ** SET WIDTH **
1120 *****
1130 LOCATE 10,10: PRINT"ONE MOM
ENT PLEASE...":LOCATE 1,22
1140 F=0:TP$=C$
1150 F=F+1:LC=LEN(C$)
1160 IF LEFT$(C$,1)=" " THEN C$=
RIGHT$(C$,LC-1):LC=LC-1:GOTO 116
0
1170 IF LEN(C$)<L THEN C$(F)=C$:
GOTO 1250
1180 FOR A=L TO 1 STEP -1
1190 IF MID$(C$,A,1)=" " THEN 12
20
1200 NEXT A:C$(F)=C$
1210 GOTO 1250
1220 C$(F)=LEFT$(C$,A-1)
1230 C$=RIGHT$(C$,LC-A)
1240 GOTO 1150
1250 C$=TP$
1260 IF F<=10 THEN RETURN
1270 L=L+1: GOTO 1130
1280 *****
1290 ** BORDER **
1300 *****
1310 CLS: ATTR 5,5
1320 PRINT STRING$(40," ");

```

## LOTTERY

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```

1330 FOR T = 1 TO 22
1340 LOCATE 39,T
1350 PRINT " ";
1360 NEXT T
1370 LOCATE 0,23: PRINT STRING$(
39," ");
1380 LOCATE 1,1
1390 ATTR 2,1
1400 PRINT " ";
1410 LOCATE 1,22
1420 RETURN
1430 *****
1440 ** TITLE SCREEN **
1450 *****
1460 WIDTH 80
1470 CMP:PALETTE 4,0:PALETTE 0,0
:PALETTE 5,0:PALETTE 1,50
1480 CLS 1:ATTR 2,1:CLS:LOCATE 1
,1:ATTR 0,0
1490 FOR T=1 TO 22:LOCATE 1,T:PRI
NTSTRING$(77," ");:NEXT T
1500 LOCATE 32,8:ATTR 3,0:PRINT"
ONE MOMENT PLEASE";:ATTR 0,0
1510 T=1:P=7:L=2:K=4:J=4
1520 LOCATE P,L
1530 READ T
1540 IF T=99 THEN L=L+1:LOCATE P
,L:GOTO 1630

```

```

1550 IF T=88 THEN L=L+1:LOCATE P
,L:GOTO 1530
1560 IF T=100 THEN GOTO 1650
1570 IF T=77 THEN P=16:LOCATE P,
L:J=5:K=J:GOTO 1530
1580 IF T=0 THEN T=1
1590 FOR A= 1 TO T
1600 ATTR 0,K
1610 PRINT " ";
1620 NEXT A
1630 IF K=J THEN K=0 ELSE K=J
1640 GOTO 1530
1650 '
1660 LOCATE 32,8:ATTR 0,0:PRINT
STRING$(19," ");
1670 LOCATE 35,18:ATTR 3,0:PRINT
"WRITTEN BY";
1680 LOCATE 33,20:PRINT"KEVIN RE
ICHERT";
1690 LOCATE 1,22
1700 FOR T=1 TO 8
1710 IF INKEY$<>" " THEN 1740
1720 FOR R=19 TO 40:PALETTE 1,R:
PALETTE 4,R+2:PALETTE 5,R+4:NEXT
R
1730 NEXT T
1740 FOR T = 1 TO 500 : NEXT T
1750 LOCATE 79,23
1760 FOR T=1 TO 24:PRINT:NEXT T
1770 PALETTE 1,50:ATTR 2,1
1780 FOR T=1 TO 24: PRINT STRING
$(79," ");: NEXT T
1790 WIDTH 40:PALETTE CMP:PALETT
E 0,0:PALETTE 1,50:PALETTE 6,23:
PALETTE 5,27:ATTR 2,1: CLS
1800 GOSUB 1300
1810 LOCATE 10,1
1820 PRINT"CAPTIVATING CAPTIONS"
;
1830 LOCATE 39,1:ATTR5,5
1840 PRINT STRING$(41," ");
1850 LOCATE 2,5:ATTR 2,1
1860 PRINT"This program is desig
ned to allow";
1870 LOCATE 2,6
1880 PRINT"you to:";
1890 LOCATE 2,8
1900 PRINT"* Alter the width of
any caption";
1910 LOCATE 2,10
1920 PRINT"* Center each line of
text";
1930 LOCATE 2,12
1940 PRINT"* Print caption with
a border";
1950 LOCATE 2,16
1960 PRINT"PRESS <ENTER> TO CONT
INUE";
1970 LOCATE1,22
1980 I$=INKEY$:IFI$=""THEN 1980
1990 GOSUB 1300
2000 RETURN
2010 *****
2020 ** PRINT-OUT **

```

# STG

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```

2030 *****
2040 C=KS*2
2050 K$(1)=CHR$(218)+STRING$(C+2
,196)+CHR$(191)
2060 K$(2)=CHR$(192)+STRING$(C+2
,196)+CHR$(217)
2070 FOR T=F+5 TO F+11: LOCATE 4
,T:PRINT STRING$(32," "):NEXT T
2080 LOCATE 39,F+12:ATTR 5,5:PRI
NT " ":ATTR 2,1
2090 LOCATE 18,F+12:PRINT " ";
2100 LOCATE 7,F+7
2110 PRINT"<ENTER>=PRINT <M>=M
ENU";
2120 LOCATE 1,22:POKE 65496,0
2130 O$=INKEY$:IF O$=" " THEN 2130
2140 IF O$="M" THEN GOSUB 2290:G
OTO 8702150 LOCATE 7,F+7
2160 PRINT STRING$(24,32);
2170 LOCATE 1,22
2180 PRINT#-2, K$(1)
2190 FOR T=1 TO F
2200 PRINT#-2, C$(T)
2210 NEXT T
2220 PRINT#-2, K$(2)
2230 PRINT#-2:PRINT#-2
2240 ATTR 2,1
2250 GOSUB 2290:GOSUB 870:GOTO
2040

```

```

2260 *****
2270 ** SPEED UP POKE **
2280 *****
2290 POKE 65497,0:RETURN
2300 *****
2310 ** DATA FOR TITLE **
2320 *****
2330 DATA 5,,5,,5,,5,,5,,5,,3,,5,
,5,,5,,3,,5,99
2340 DATA ,5,,3,,3,,3,,5,,3,,3
,,,3,,3,,5,,3,2,2,,,4,88
2350 DATA ,5,,5,,5,,3,,5,,4,,,2,5
,3,,5,,3,,,,,2,2,99
2360 DATA ,5,,3,,,7,,5,,4,,,2,
,3,,3,,5,,3,2,2,,,3,,99
2370 DATA 5,,3,,,7,,3,5,3,,3,,
3,,3,,3,5,,,3,,,5,88
2380 DATA ,99,,88,77
2390 DATA 5,,5,,5,,5,,5,,5,,3,,
,5,99
2400 DATA ,5,,3,,,3,,3,,5,,3,,3
,,,2,2,,,4,88
2410 DATA ,5,5,,5,3,,5,,3,,3,,,
,,,5,99
2420 DATA ,5,,3,,,7,,5,,3,,3,,
,2,2,5,,99
2430 DATA 5,,3,,,7,,3,5,,5,,3
,,,5
2440 DATA 100

```



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Requires CoCo 3, 256K RAM, floppy controller with either Tandy Disk  
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15,000 word dictionary or friends. 256K.

In the June '88 issue of *THE RAINBOW* I wrote a column titled "Digitizing the World Revisited," describing my experiences with the Micro Works DS-69 and DS-69B video digitizers. The DS-69 and DS-69B were the staple CoCo video digitizers for several years and are excellent products. However, the DS-69s are somewhat limited in that they digitize a video image to 256-by-256 pixels in 16 levels of gray. With the CoCo 3 you use 640-by-192 pixels, and it would be nice to have a unit that takes advantage of that resolution. The Game Point Rascan video digitizer provides this capability as well as full-color and 3-D graphics for the CoCo 3. Hard to believe? Read on. . .

### What's a Video Digitizer, Anyway?

A video digitizer converts a standard-format television picture into digital data — the same standard format as used in a color camcorder, color video cassette recorder, television receiver with video output, and monochrome (black and white) surveillance camera. This signal is not the same as that from a television antenna, which is tens of thousands of times weaker and in a different format. (The video information is carried by a radio signal.)

A standard television signal has 525 scan lines per screen, as shown in Figure 1. Actually there are 60 *frames* of 262.5 lines each, with each frame making up one half of a 1/30th second picture. If you feed video from a camcorder, video cassette recorder or surveillance camera into a video digitizer, it digitizes a video picture scan line by scan line in about 10 seconds, converting the picture into digital pixels. In the case of the Rascan video digitizer, 640 pixels per scan line are produced for *every other* scan line. That is, there are a total of 384 scan lines, but every other line is skipped leaving 192 digitized scan lines. This 640-by-192 digitization fills the CoCo 3 high-resolution screen. Although some digitizers *freeze* a picture for one frame, the Rascan unit (and the DS-69) digitizes on-the-fly, so it's necessary to have a stationary image.

If the standard television signal is a color signal, the color information (contained in a phasing scheme) is thrown away

*Bill Barden has written 27 books and over 100 magazine articles on various computer topics. His 20 years' experience in the industry covers a wide background: programming, systems analysis and managing projects for computers ranging from mainframes to micros.*

*Full color and greater resolution for the CoCo 3*

# Put on Your 3-D Glasses

By William Barden, Jr.  
Rainbow Contributing Editor

by the Rascan. It is possible to decode this and send it to a display like the CoCo's, but it is more expensive. Also, the CoCo is not really capable of displaying full color in 640-by-192 mode but just four selected colors (16 colors in 320-by-192 mode), which does not reproduce the many hues and intensities of a typical color picture.

### Shades of Gray

Without color a television signal still contains many graduations of intensity,

ranging from black (0 intensity) to white (maximum intensity) and an infinite number of shades of gray in between. To digitize a picture it's necessary to encode the infinite number of levels of gray into a fixed number of different levels. The simplest case is 0 for black and 1 for white. However, even the swimsuit issue of *THE RAINBOW* would look uninspiring with only two shades. Four levels (00, 01, 10, and 11) is better, but 16 levels is even better yet (0000, 0001, 0010, 0011, 0100, 0101, 0110, 0111, 1000, 1001, 1010, 1011, 1100, 1101, 1110, and 1111).

How can you represent shades of gray on a CoCo screen? Rascan and DS-69 both use a *dithering* process similar to the half-tone representation used in newspapers. In this process some resolution is given up to produce the 16 gray-scale levels.

### Hooking the Beast Up

When I first saw the Rascan ads in *THE RAINBOW*, I immediately knew I had to try one. I'm a graphics freak and the idea of digitized 640-by-192 images is very appealing. One (four-level) gray day a box from Game Point appeared on my doorstep. The day brightened immediately as I eagerly ripped it open and uncovered a white box about the size of three CoCo ROM cartridges stacked on top of each other. (The unit is installed next to the CoCo on the left side and requires its own AC power.)

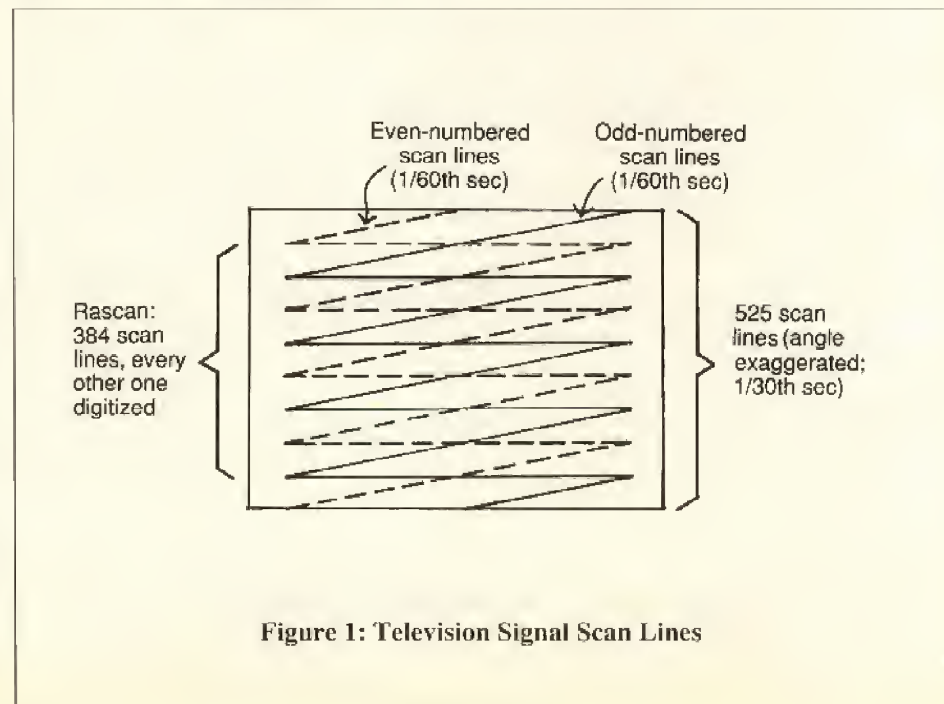


Figure 1: Television Signal Scan Lines



# Color Computer Software from Cer-Comp Ltd.

## Window Master V2.2

The hottest new program available for the Color Computer III! Now you can have Windows, Icons, Buttons, Pull-Down Menus, Edit Fields and Mouse Functions built into your Basic or Machine Language Programs easily and quickly, without the need for OS9.

It supports up to 31 Windows on the display, multiple fonts in 54 possible sizes and styles, Enhanced Basic Editing and much more. It adds over 50 Commands and Functions to Basic to fully support the Point & Click Window System. In fact it has so many features it would take several pages to describe them all.

It is completely compatible with existing Basic programs and takes absolutely no memory away from Basic. It contains a built in Ram Disk which is completely transparent to Basic (512k version) for enhanced operation.

It requires 1 Disk Drive, R.S. Hi-Res Interface & Joystick or Mouse. Includes both the 128k & 512k versions for only \$69.95

## Window-Ware

**Window Writer** - A Point & Click Word Processor, features both Mouse & Keyboard type editing, proportional printer support, powerful formatting capability, works with any printer. On screen Italic, bold etc. WYSIWYG Requires Window Master & 512k- \$59.95

**Window Writer/W** - for non Window Master users includes all features as described above. Requires 512K & Disk \$79.95

**Window Basic Compiler** - A Basic Compiler similar to CBASIC only it compiles all the Window Basic statements to create super fast M.L. programs & Desk Accessory programs for Window Master \$99.00

**Window EDT/ASM** - A full featured Editor/Assembler and Debugger for the Window Master System \$49.95

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## 512K RAMDISK & TESTER

RAMDISK is an ALL Machine Language program that will give you 2 ULTRA High Speed Ram Disks in you CoCo-3. Plus it allows your CoCo-3 to run at double speed all the time even for disk access!!! It will not disappear when you press reset like some other ramdisk programs. The MEMORY tester is a fast ML program to test the 512K ram. It performs several bit tests as well as an address test.

Requires 512K & Disk \$19.95

## CBASIC Editor/Compiler

### The ULTIMATE Color Computer BASIC COMPILER!!!

If you want to write fast efficient machine language programs and you don't want to spend the next few years trying to learn how to write them in Assembly language or with a cheap compiler, then CBASIC is the answer!!!

CBASIC is the only fully integrated Basic Compiler and Program Editing System available for the Color Computer. It will allow you to take full advantage of all the capabilities available in your CoCo without having to spend years trying to learn assembly language programming. CBASIC allows you to create, edit and convert programs from a language you are already familiar with Enhanced Disk Color Basic, into fast efficient machine language programs easily and quickly.

CBASIC supports all the enhanced hardware available in the CoCo 2 & 3, including Hi-Res Graphics, & Screen displays, Extended Memory and Interrupts. We even added advanced commands not available in Basic to give you a level of control only available to very advanced Machine Language Programmers. Plus we made it exceptionally easy to use, not like some other compilers. CBASIC is the friendliest and easiest compiler available for the Color Computer.

CBASIC is a powerful tool for the Beginner as well as the Advanced Basic or Machine Language programmer. CBASIC features well over 150 Compiled Basic Commands and Functions that fully support Disk Sequential and Direct access files, Tape, Printer and Screen I/O. It supports ALL the High and Low Resolution Graphics, Sound, Play and String Operations available in Enhanced Color Basic, including Graphics II/GET, H/Put, H/Play and H/DRAW, all with 99.9% syntax compatibility.

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Supports: R. S. Modem-Pak & Deluxe RS-232 Pak.

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## "The SOURCE"

### DISASSEMBLER & SOURCE CODE GENERATOR

The SOURCE will allow you to easily & quickly Disassemble Color Computer machine language programs Directly from Disk and generate beautiful, Assembler Source code.

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- Written in Ultra Fast Machine Language.

Coco 1, 2 or 3 Disk \$49.95

## EDT/ASM III

### DISK EDITOR ASSEMBLER

EDT/ASM III is a Disk based co-resident Text Editor & Assembler. It is designed to take advantage of the new features available in the CoCo-3 with either 128K or 512K of memory. It has 8 display formats from 32/40/64/80 columns. There is also a free standing ML Debug Monitor.

EDT/ASM III has the most powerful, easy to use Text Editor available in any Editor/Assembler package for the Color Computer.

- Local and Global string search and/or replace.
- Full Screen line editing .
- Easy to use Single key editing commands.
- Load & Save standard ASCII formatted files.
- Block Move & Copy, Insert, Delete, Overtime.
- Create and Edit files larger than memory.
- The Assembler features include:
- Supports Conditional IF/THEN/ELSE assembly.
- Supports Disk Library file up to 9 levels deep.
- Supports standard Motorola directives.
- Allows multiple values in FCB & FDB directives
- Allows assembly from the Buffer, Disk or both.

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Photo 1



Photo 2

The Rascan unit *does not* plug into the Multi-Pak or ROM cartridge slot. It has two cables that plug into the left and right joystick ports. This is good and bad. It leaves a free Multi-Pak slot but means you have to unplug the joystick cables. On the other hand you don't need to buy a Multi-Pak to run Rascan.

I plugged my Sanyo VC1224 monochrome video camera into the RCA jack on the rear of the Rascan unit. (The Sanyo

camera without lenses costs about \$170.) By adding a C-mount adapter available at many camera stores, you can use 35mm SLR camera lenses (the adapter costs about \$15). I have a 70mm-210mm Canon lens on the camera that I used for all the pictures in this article. The cable from the camera is an inexpensive video cable with RCA jacks on either end, which you can buy at your local Radio Shack.

I switched on the Rascan unit and ran 800T from the Rascan disk. Uh, oh — trouble! When I attempted to enter commands, nothing happened — there was no text on the screen. I found when I turned the Rascan unit off, things operated normally. I opened the manual. Sure enough, the manual confirmed that the Rascan unit should be powered up directly before digitizing pictures and turned off after digitizing. I then took time to print up a three-foot banner that states "Always read the manual first" and pinned it up in my office.

In light of this operator error I thought I should try to display some sample files as a first step. I pressed ESC to bring up the main menu and then selected the proper menu item to

load picture files from disk. The samples I saw were excellent.

I made a cursory scan of the manual and started digitizing data myself. When digitizing, you must have a small television or monitor so you can frame the picture and focus. I have a nine-inch monochrome TV fed by an RF modulator that converts the camera output to television Channel 3 or 4. I framed a shot of my Sheltie, JB, and adjusted the focus. I then switched on the digitizer box and after a moment saw the results on the CM-8 screen — instant Shetland sheepdog! At that moment my cousin Ferd walked in.

#### Ferd's Photos

Ferd Barden is a typical computer nerd, complete with taped eyeglasses and pocket protector.

"Hey, Ferd, how ya doin'?" I queried, thinking all the time that he might be a good subject to digitize.

"Well, pretty good," he mumbled, "if I can get this program working. It seems the program clobbers the stack after about 30,000 iterations."

"That's great, Ferd. Here, sit down and rest for a while." I steered him over to a chair facing the camera. "Tell me about your stack problem," I offered, swiveling the camera and focusing on his horn-rimmed glasses.

"Well, I get halfway through the program — I've almost computed the matrix — and then I . . ."

"Sounds great — here, just keep focused on this magazine centerfold while I take some pictures," I suggested.

The first picture I took required some adjustment. There are two controls on the Rascan, one for contrast and one for brightness. Getting the proper picture qualities is largely a matter of trial and error — adjusting one control and then the other. How-

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ever, it goes smoothly, especially if your subject is well-lighted.

The first picture I took of Ferd was the 16-level, 640-by-192 resolution shot shown in Photo 1. There is a white background in the shot that doesn't offer much contrast against Ferd's white shirt, but the mechanical pencils in his pocket protector show up quite nicely.

I then changed the mode to four-level, 640-by-192 resolution. In this mode there are only three levels other than white, and you get a type of contouring effect (see Photo 2).

There are 16 levels in a digitized picture. These levels can be assigned false colors by another mode in Rascan. The initial false colors assigned to Ferd's 16-level image are shown in Photo 3. A total of 64 different colors can be displayed in the CoCo 3's



Photo 3

320-by-192 high-resolution mode in a palette of 16. You can choose any of the 64 colors and assign them to any level via Rascan's Edit Color and Custom Paint modes. In this manner you can actually change the colors into something approaching real life, but I didn't have time to do this with Ferd's image. Besides, Ferd is scary enough in real life.

#### Digitizing Photos

Ferd left to go to a computer club meeting. (The club was having a stimulating lecture he couldn't miss — something about upgrading MC-10s to CoCo 3s.) I was left to my own devices and decided to try digitizing some newspaper photos. The first one I tried was a very poor resolution shot of a cougar shown in Photo 4. Considering the original, I think it turned out fairly well. Sixteen-level mode was used here.

The next digitization I attempted was a portion of the Rascan ad from the pages of THE RAINBOW. Using a close-up lens, I digitized a two-by-one-and-one-half inch area, adjusting the brightness and contrast to essentially get two colors, black and white. The results are shown in Photo 5.

#### Full Colors . . .

Having excellent luck with the basic



Photo 4

modes, I went on to full colors. Just how can you get a full range of colors out of four colors on a CoCo 3 Hi-Res screen? Rascan does it by taking three digitizations of the same subject: one with a red filter, one with a green filter, and one with a blue filter. If you remember grade school art classes, you know these are the primary colors. They are mixed to produce any hue of color. Rascan maintains four different buffer areas on a 512K byte CoCo 3. The first buffer is called the *main buffer* and stores a 16-level black and white image. There are three additional buffers called the red, green and blue buffers, each holding a filtered digitization of the same scene.

Once the scene has been digitized in red, green and blue, the image can be viewed in full color by selecting a 4096 mode. In this mode the three screens are displayed in rapid sequence. The eye integrates the three colors into the full range of colors present in the original shot.

I loaded a sample from the Rascan disk and was impressed with the coloration. The disadvantage of the display, though, was flicker. Although Game Point claims that flicker is less on a normal television, the flicker on a CM-8 is quite noticeable. It's about equivalent to the flicker you see on some renditions of silent movie footage. Still it *is* full color and the image compares very favorably to the EGA mode used in MS-DOS systems.

I had to try the technique myself. I



Photo 5

needed the filters immediately. Looking in my Edmund Scientific catalog, I saw that two-by-two-inch red, green and blue filters sell for \$3.95 — a bargain. However, even with airfare reductions, Barrington, New Jersey, was out of the question — and it was too late to order the filters from Game Point. I opted instead for trying to locate red, green and blue cellophane locally. I filtered through two malls and assorted drug and craft stores. After three hours I found what I'd been looking for — a roll each of red, green and blue cellophane.

I cut out a square of each color and set up a small scene on photographic background paper using Sesame Street characters. I added about 200 watts of lighting using photo reflectors. Once the scene is ready to

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be shot, it literally takes about a minute to shoot the three buffers. Just select the proper buffer from a menu, select the digitize function, flip a switch on the digitizer, and sit back and watch the digitization on the screen, which proceeds from right to left in a vertical column. The screen refreshes every 15 seconds or so while digitizing, and you get a warning beep at the end of each refresh. During this time you can press ESC to save the current digitization.

I captured the red, green and blue screens, saved them on disk and played back the shots in full-color mode. The results were fairly good but nothing near the quality of some of the samples included with Rascan. It's amazing how much additional optical information is added to a shot when color is used. The monochrome digitization tends to hide picture information; adding color greatly aids the brain in interpreting what is shown in a screen.

Although the shots I've taken in full color are not quite sharp enough for publication, Photo 6 shows a sample from the Rascan disk, which shows up quite well.

### ... And 3-D

Another feature found in Rascan is the capability to view three-dimensional images. The process is similar to viewing a full-color picture but requires red and blue or red and green three-dimensional glasses.



Photo 6

(Save your glasses after watching *Jaws III* or the most recent soft-drink promotion on television to make your own out of filter material, or buy them from Game Point). A red-filtered shot of a scene is taken and saved in the red buffer. The camera is shifted about four inches to the right or left, and a blue- or green-filtered shot is taken. A special view in 3-D mode alternately displays red and green or red and blue buffers.

There isn't a 3-D sample on the Rascan disk, so I decided to try my own. I took two shots of the Cookie Monster and Big Bird and played them back. The flicker wasn't as bad in 3-D mode and there actually is a 3-D effect. I suspect you can get good results after acquiring some expertise in this area.

### Other Features of Rascan

In addition to the features described above, Rascan has other functions that allow you to edit and analyze the screen image, copy files and buffers, and convert to *CoCo Max 3* and *Color Max 3* formats:

- **Screen Image Adjustment:** Rascan allows you to center the scanned image by moving the image up or down when you press the ALT or CTRL keys. The aspect ratio of the image can be adjusted by pressing the lesser-than (<) and greater-than (>) keys. A *negative* image is displayed by using the negative image function, which inverts the image in a split second.

- **Save and Restore Files:** Rascan allows you to save and load any image onto disk. Rascan images have the file extension .IMG to denote a Rascan file.

- **Histogram:** The histogram function analyzes a digitized image, showing a bar graph representing the number of times each level is used. This can be an aid to getting a good balance in the case of a picture in which there should be an equal number of gray scales.

- **Copying Buffers:** The image in any buffer can be transferred to any other buffer by the Rascan Copy Buffer function.

- **Conversion to *CoCo Max III* and *Color Max 3*:** Two utility programs allow you to convert between Rascan format and *CoCo Max III* or *Color Max 3* format. Once in these programs, you can perform different editing functions on the digitized images, including cropping or addition of text.

- **Slide Show:** Another utility program allows you to prepare a slide show or sequence of images from disk.

- **Printer Support:** Although not present in this version, Game Point is upgrading Rascan for typical CoCo printers.

### Synopsis

I'd rather not review software or hardware I don't like. You know in advance that any time a product appears in this column, I'll be raving about it. Such is the case with Rascan. I'm hooked on graphics — the higher resolution the better.

Rascan works perfectly for me, with only one glitch caused by an operator error (faulty keyboard scan when digitizing). I like the pop-up menus on the software and the sound feedback when functions are selected. In general Rascan is professional. About the only thing that could stand improvement is the manual — but it's no worse than most everyone else's CoCo documentation — a level below that which you get with MS-DOS systems.

The \$159.95 price seems more than reasonable compared to MS-DOS equipment. If you have your own camera and

spare monitor, there is little other expense. If you don't have a camera, consider getting a monochrome surveillance-type camera that can be purchased used for about \$75 and new for \$250 with a lens. If you don't have a monitor, buy a used or new black and white monitor for \$50 to \$100. Connecting cables costs another \$12. The total bill is about as follows:

|          |       |
|----------|-------|
| Rascan:  | \$160 |
| Camera:  | \$75  |
| Monitor: | \$75  |
| Cable:   | \$12  |
|          | <hr/> |
| Total:   | \$322 |

This is a little hefty for many CoCo users, but you can get by without the camera and monitor if you want to digitize directly from VCR or freeze-frame television. CoCo 1 and 2 users must be content with monochrome DS-69 or DS-69B — still fine units, but with resolutions of 256-by-256 in 16 levels.

### Still More on CoCo Outputs

A few months ago I wrote a column on CoCo outputs. Charles G. Weiser of Malibu, California, wrote a nice letter telling me I was wrong when I said there were only three programmable outputs on the CoCos. He uses the sound output of the CoCo to feed 567 tone decoders. Although he states that 255 tones can be decoded, he uses 15 tones with fifteen 567s.

Each 567-tone decoder is tuned to a particular tone. The output of the 567 then goes to opto-couplers to control relays or transistors. This is a darned good idea and might merit a separate article in the future, at which point I'll give Mr. Weiser credit again. Those of you who know what I'm talking about will catch the concept immediately. Other readers, check out the 567 tone decoder specs at your local well-equipped electronics store. I can't find the part in Radio Shack's 1990 catalog, although it's been carried in the past.

Dennis Buswell of Jefferson City, Montana, wrote to say that Heathkit made at one time — and may still have in stock — an RS-232-C to BSR X10 Interface (GD-1530). This might be an alternative to the Plug 'N Power controller for the CoCo if you can locate one.

David B. Smith of Grand Portage, Minnesota, sent a number of ideas for CoCo inputs. One I liked was using a potentiometer in a home-built foot pedal. Another was a steering wheel for driving simulation games. I'd like to see that implemented.

See you next month with more CoCo topics. ☺

NEW!

# Window Writer 1.2

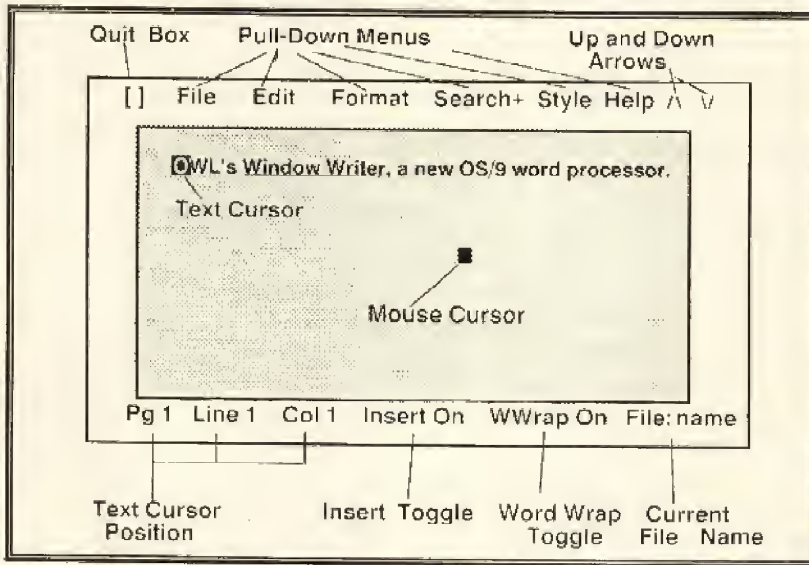
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The menus and help screens can be reached by cursor keys or the mouse

(or joystick) or can be accessed by control keys.

## Hi-Res Display

**Window Writer** uses an 80-column monitor display screen for clarity. As shown in the above screen drawing, you can quickly see how to access the menus and help screens. You can determine the current position by page, line number, and column. The mouse can use this section to quickly change to a specific page or line in the file. The text insert and word wrap toggles also are indicated and changeable with the mouse button.

## Ram Disk

A RAM disk is set up in **Window Writer** to make full use of all or a user specified portion of the memory on the 512K CoCo 3. On the 128K CoCo a smaller RAM disk is set up to still allow use of all available memory for file editing. For use of all features, a 512K machine is required.

The RAM disk is used for storage of the file(s) being edited, for the clipboard for cut and paste, and as a print spooler for the file being printed. **Window Writer's** clipboard can be saved to disk or pasted into any file being edited because files use the same clipboard memory. The RAM disk also can be used with other OS/9 programs.

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## Editing

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An introduction to file-transfer protocols

# Observing the Social Graces

By Tim Koonce

**S**o you finally figured out how to use a modem and a terminal program to call up and leave messages on local BBSs, or maybe even how to set up an account on Delphi or CompuServe, but you're a little confused about how to download files to your CoCo. Or maybe you've been downloading for a long time but you're starting to hear more about Ymodem and aren't sure what's up. Are you baffled by a friend telling you about the wonders of Kermit? Is Zmodem really better than Ymodem? What is *batch*?

Even long-time modem users often get confused about the differences between the available protocols and why certain ones are preferred.

## In the Beginning

In the mid '70s, when people were first trying to figure out how to connect modems to CP/M computers, it became clear that it should be easy to send files from one machine to the next. The idea was that I could call you up, and we would both turn on our modems, setting up a program on each end to copy the file across. Several groups of people set out to design such programs by writing down a *protocol*, a set of rules describing what the transfer program does.

## ASCII Files Are Easy

Some files are simple to transfer. Straight ASCII text files are usually not impaired by a few spelling errors, so text files are easy to handle by just opening a *capture buffer*. In this setup one side lists the file and the other side captures it. One nice addition is the use of CTRL-R and CTRL-T to mark the beginning and end of the file. This way the receiving side knows exactly where the file starts and ends. Using these two control characters is sometimes referred to as *RT Buffer Capture* or *Automatic Buffer Control*. This simple method of transferring files is also the fastest, although it isn't sufficient for many purposes.

## Christensen's Protocol

Binary files such as programs and compressed files (many graphics formats include compression) and even program

---

*Tim Koonce, currently pursuing his doctorate in mathematics at the University of California at Berkeley, has worked with the Color Computer since 1982. He is the author of VTerm and is the CoCo SIG Database Manager on Delphi.*



source code require more care for several reasons. First, errors are more important. If one letter is transferred wrong in a long text file it results in a misspelled word; if one byte of a program is wrong, it can be disastrous. Secondly, you must know exactly where a binary file starts and preferably where it ends. While it is possible to use one character to mark the start of a binary file, you can't use just one character to mark the end because that character may appear in the file being transferred.

People have spent a lot of time developing methods to transfer all file types reliably. Some attempts were sophisticated and offered a lot of features. But the one that became popular was Ward Christensen's simple Xmodem protocol.

In order to understand Xmodem you need to understand a little about CP/M files. Every CP/M file is an exact multiple of 128 bytes. That's the size of a CP/M sector. For text files, which may not fit in an exact number of sectors, CTRL-Z is used to mark the end of the text. Christensen's protocol was first implemented in his series of *MODEM* programs. *MODEM2* has a version of the protocol, and *MODEM7* includes a batch extension, which has faded from popular use. *XMODEM*, from which the current name comes, is intended for unattended remote operation so you can get a file from a friend's computer without having them there. The basic protocol consists of transferring each sector of the file and awaiting an acknowledgement.

To establish some terminology, a group of bytes sent together constitute a *packet*.

Most protocols distinguish between data packets, which have the data you're attempting to transfer, and control packets, which communicate other information. In Xmodem control packets are always single characters. The makeup of an Xmodem data packet is outlined in Figure 1.

| Bytes |   |
|-------|---|
| 1     | - Character 1 (SOH character)                           |
| 1     | - sequence number (starts at 1, wraps from 255 to zero) |
| 1     | - complement of sequence number; for error checking     |
| 128   | - data; one sector of file                              |
| 1     | - checksum; sum of the 128 data bytes                   |

**Figure 1: Xmodem Data Packet Format**

Like many other protocols Xmodem is receiver driven, meaning the side receiving the file controls what happens. The side sending the file sim-

ply waits until the receiver tells it what it needs to do.

The receiver starts by sending a NAK (Negative AcKnowledge) packet. (In Xmodem, this is the single character NAK.) If this gets no response, it repeats every 10 seconds until the sender answers by sending the first data packet. When the receiver gets the first data packet, it adds up all the bytes in the packet and compares it against the checksum at the end. If they agree, there is no error and the receiver sends an ACK (ACKnowledge) packet. The sender interprets the ACK as "send the next data packet." If the checksums don't agree or there is some other problem, the receiver sends a NAK, which the sender interprets as "re-send the same data packet." When a data packet is received incorrectly, it is re-sent until it makes it through correctly. Then the next data packet is



dealt with. When there are no more sectors in the file, the sender sends an EOT (End Of Text) packet, which the receiver acknowledges, and the transfer is complete. Figure 2 illustrates how a file 256 bytes long might be transferred with Xmodem. Notice that the Xmodem protocol allows for either side to start first. If the transmitter starts first, it simply waits until the receiver starts.

Xmodem has become popular because it is simple. Yet even this simple protocol has a number of important features. First a check value is included in every data packet to allow the receiver to check that the packet was correctly received. In Xmodem this check value is computed by adding up the values of each byte, which is called a *checksum*. Checksum error checking works well in protocols that have small packet sizes, such as Xmodem, but becomes progressively less reliable as the packets get larger. Another source of potential error is that some of the *overhead* bytes (parts of the packet that aren't data) might be incorrectly received. If the first byte is received wrong, then the receiver ignores the entire packet and sends a NAK (not a major problem).

If the checksum is received incorrectly, the checksums won't match; at this point the receiver NAKs the packet and it is re-sent. If the sequence number is received incorrectly, there could be a problem. It is critical in Xmodem that the data packets be sent in the correct order, and the sequence numbers provide a check on that. After the sequence number is the complement of the sequence number (each one in the binary number is changed to zero, and vice versa), so the receiver can check to make sure that part of the packet is correctly received. (It is interesting to note that the first three bytes of an Xmodem data packet should always add up to zero.) This concern for the sources of error is a common theme in the design of file transfer protocols.

### Why Not Xmodem?

Xmodem is old, simple and functional. Why, you might ask, would anyone want to use anything else? The major reasons are speed, accuracy and flexibility. Let's first look at what keeps Xmodem from being as fast as it could be.

When talking with systems such as Delphi or CompuServe, all of your data must go through a network. Since that

network sometimes gets very busy, it can sometimes take several seconds for your data to get through the network. In Xmodem, after the sender finishes sending a packet, the receiver may not finish receiving it until several seconds later. The receiver then sends an ACK, which takes several more seconds to get back to the sender. At 1200 baud, half of the time can be spent waiting for this delay. At 2400 baud, nearly three quarters of the time in an Xmodem transfer can be spent waiting for network delays. Clearly, at higher baud rates, this additional time becomes the limiting factor to the total transfer speed.

Although Xmodem takes pains to en-

able to transfer any eight-bit byte. There are some situations in which this is simply not possible. A typical example is when transferring files to/from mainframe computers. Another example is when many networks use certain characters for special purposes, and havoc ensues if those characters appear in the data being transferred across the network. Newer protocols use various methods to encode certain characters to avoid these problems.

Finally one convenience issue is that under Xmodem, there is no way to transfer a batch of files at one time without operator intervention, a capability that is a part of most newer protocols.

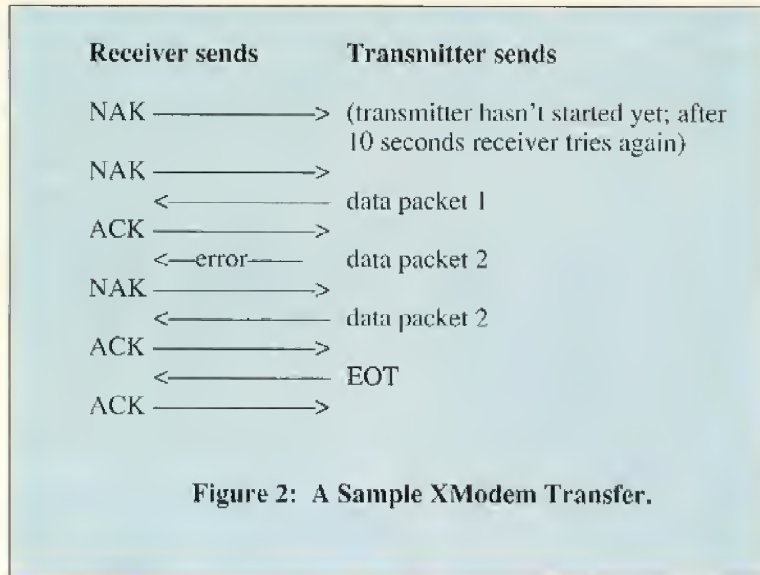


Figure 2: A Sample XModem Transfer.

sure that each data packet is correctly received, there is no error checking for Xmodem control packets, which are all single characters. One example of how an Xmodem transfer can fail is if a NAK from the receiver is received by the sender as an ACK. In that case the sender goes on to the next data packet while the receiver is expecting a resend of the current data packet. Another example is if telephone line noise causes the receiver to see an EOT character the sender does not send. In this case the receiver terminates before the full file is transferred. More modern protocols include error checking on control packets to guard against such problems. Even with data packets there are much better methods of error detection than the simple checksum.

Xmodem is simple, but that simplicity comes at the price of flexibility. Xmodem only transfers files that are a multiple of 128 bytes long. Usually this means the original file is "padded," typically with CTRL-Z characters, to fill out the last packet. This extra padding can wreak havoc with many datafiles and can cause a variety of other problems. Also, to transfer binary files requires that the serial connection be

### Common Shortcomings

A few issues concerning writing programs to handle Xmodem transfers are often overlooked. One has to do with the transfer of ASCII files. Under CP/M, ASCII files use a CR/LF (Carriage Return plus Line Feed) pair of characters to mark the end of a text line. Some systems such as UNIX use a single LF character. The CoCo, under both OS-9 and RS-DOS, uses a single CR character for this purpose. The Xmodem protocol specifies that all ASCII files should be sent with CR/LF characters between lines. For the

CoCo, this means adding an LF character after each CR and removing LF characters on download. Such processing should not be done for binary files. Few CoCo terminal programs offer the option of doing this end-of-line conversion for ASCII files. A few try to do such conversions automatically by checking the first character of the file, but this introduces many problems of its own.

Another common problem is how the end of the file is handled. When the sender receives an ACK for the last packet, it should send an EOT and then wait for an ACK of that EOT. Some systems routinely NAK the EOT and wait for the EOT to be resent. Programs that do not wait for the ACK can cause problems with systems that do this. When an unacceptable number of errors occurs, it is customary to terminate the transfer with the CAN character (CTRL-X). Systems that terminate upon receiving one CAN character sometimes abort when a CAN character is generated by noise. It is preferable to wait for a sequence of three CAN characters before aborting. The side that requests the termination should probably send at least five consecutive CAN

characters in case noise causes one of them to be incorrectly received.

Receivers and transmitters using Xmodem allow each other a specific amount of time for a proper response. If one end takes too long and this *time-out delay* is not satisfied, a Time-Out Error is generated. This normally beneficial aspect of Xmodem has its drawbacks too. Since most terminal programs are tested over local telephone connections, it is not uncommon for the time-out delay to be too short for use over a network, causing a lot of unnecessary time-out errors. However, a very long time-out delay can slow error recovery when a character is lost due to noise. Some terminal programs go to the extreme of having two different versions of Xmodem, one with shorter time-out delays (less than 10 seconds) for quick error recovery over local telephone connections, and another with longer time-out delays (sometimes as long as 30 seconds) for use over slower networks such as those used to connect to CompuServe and Delphi. The best option is for the program to adjust the time-out delay based on the round-trip delay it sees, but this is difficult to do well.

One point of debate is the proper handling of a file partially received before the transfer is aborted because of errors. Some

people claim the file should be deleted so the user does not mistakenly believe the file was received correctly. This reasoning has some merit for binary program files, where a partial program is not useful. However, for text files and other files where the problem may be something like the EOT incompatibility just mentioned, it seems preferable to keep the partial file, issue an appropriate error message, and let the user decide if the partial file is useful.

### Improving a Standard: Xmodem-CRC

It wasn't long before people tried to improve Xmodem. In order to reduce the chances that an incorrect packet is accepted by the receiver, it is good to use a 16-bit Cyclic Redundancy Check (CRC) for error detection, rather than an eight-bit checksum. By taking advantage of the properties of irreducible polynomials, CRCs are much more sensitive to errors than checksums. This change alone provides a significant increase in the reliability of Xmodem-CRC transfers over standard Xmodem. In order to maintain compatibility, though, it is desirable that the sender be able to figure out which type of error checking it should use. Xmodem-CRC handles this problem by modifying the initial handshake. In a standard Xmodem transfer, the first thing

the receiver sends to the transmitter is a NAK. In an Xmodem-CRC transfer, the receiver sends a capital C (Character 67), signifying that CRC error checking is to be used. The receiver sends this several times and if the transmitter doesn't respond, the receiver assumes the transmitter can only use standard Xmodem and switches to a NAK, signifying that checksum error detection should be used. The transmitter watches for the first character from the receiver. If it is a NAK, it assumes the receiver can only use checksum error detection. Otherwise the transmitter uses CRC error detection.

The biggest problem with Xmodem-CRC is that routines for calculating CRCs are difficult to understand. Cyclic Redundancy Checks rely on being able to do polynomial division modulo two. However, routines for calculating the most common CRCs (there are many different ones, and the 16-bit CRC-CCITT used by Xmodem-CRC is by far the most common) are not difficult to find. In fact most people simply use routines already written by someone else.

### Next Online: Ymodem

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other Modem) terminal programs. While working on these, Chuck became an expert on weaknesses in the Xmodem protocol. Chuck compiled several ideas that other people had been suggesting (including the use of CRC error checking from Xmodem-CRC) and several ideas of his own and developed an extension of Xmodem known as Ymodem.

Ymodem's major improvements over Xmodem are in its longer packet size, which gives increased speed over networks, its use of CRC error detection, and its batch capabilities. Let's look at each of these separately, then get an overview.

Earlier you saw that one weakness of Xmodem is that for every data packet transferred you must wait for data to make it across the network

both ways, resulting in a very long delay between packets. One simple way to reduce the effect of this delay is to make the packets bigger. This way a smaller percentage of the time is spent waiting for the round-trip delay. The trade-off is that if an error occurs, it takes longer to resend a longer packet than it does to resend a short

packet. But over modern networks there are few enough errors that this is usually not a serious problem. As far as the protocol itself goes, you need to make one slight change to the form of a data packet, since you want to maintain as much compatibility with Xmodem as possible. In Ymodem there are actually two types of data packets, which can be distinguished by the first byte. Figure 3 outlines what a Ymodem data packet looks like.

One of the nice parts of the Ymodem

data packet, so under noisy conditions it is desirable to use shorter packets. Finally, a properly written Ymodem receiver can receive files from an Xmodem sender with no problems at all. In fact a properly written Ymodem sender can send to an Xmodem receiver with no problems if it interprets the initial handshake properly.

Ymodem handles the initial handshake in the same way Xmodem-CRC does. The transmitter watches for the first character from the receiver. If it is a NAK, the receiver can use only standard Xmodem

(128 byte packets and checksum error detection). If it is a C, the transmitter uses Ymodem (1024 byte packets and CRC error detection). The convention that a NAK handshake means to use 128-byte pack-

ets, as well as checksum error detection, guarantees compatibility with programs using the Xmodem protocol.

The third major addition Ymodem makes to the Xmodem protocol is batch capabilities. Common usage is that Ymodem refers to just the 1024-byte data packets and CRC error detection. Ymodem-batch refers to

|              |  |
|--------------|--|
| 1 byte       | Start of data packet character. Character 1 means there are 128 data bytes; Character 2, 1024. |
| 1 byte       | Sequence number  |
| 1 byte       | Complement of sequence number  |
| n bytes      | Data, either 128 or 1024 bytes, depending on first byte of packet.                             |
| 1 or 2 bytes | Either 1-byte checksum or 2-byte CRC check value, depending on the initial handshake           |

**Figure 3: Ymodem Data Packet**

protocol is that it retains the ability to use 128-byte data packets. This is nice for several reasons: First, when transferring the last part of a file, there may not be enough data to fill a 1024-byte packet. It may be faster to send a few shorter packets, rather than one long packet. Second, it takes much longer to retransmit a longer

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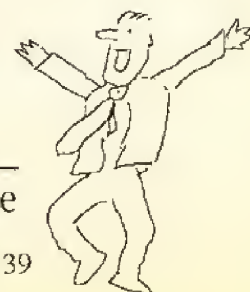
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the full Ymodem protocol with batch capabilities, although many purists only use the term Ymodem to refer to the full protocol, including batch capabilities. Chuck Forsberg added batch capabilities to Xmodem by noting that the packet sequence number starts at one. So he defined Packet 0 to be a special packet containing the file name, length and other information about the file being transferred. (Those interested in writing Ymodem programs should note that Packet 256 is not unusual.) In this way several files can be transferred consecutively without operator intervention. The file length is a particularly nice addition to the protocol since it allows the receiving end to remove extra padding that must be added to fill the last data packet. However, on some systems it is possible for files to grow before they are completely sent, particularly due to end-of-line conversions. Many Ymodem-batch senders intentionally use a too large file size, which makes this less useful.

In summary Ymodem makes three major additions to Xmodem: It uses a longer data packet for faster transfers over networks; it can optionally use CRC error detection, which makes it much more reliable; and when fully implemented, it supports a batch option that makes multiple file transfers much more convenient and can also remove problems with extra file padding. Ymodem does not address the reliability problems of having single-character control packets, nor does it address the need for all 256 data bytes to be transferrable through the connection. For most BBSs and information services these are not major problems, but there are situations in which they can make Ymodem unusable.

### Half-Duplex Versus Full-Duplex

All the protocols discussed so far have been *half-duplex* protocols. Here the term half-duplex is being used in a technical sense, meaning that only one side sends at a time. This is handled by alternating which side sends. Half-duplex protocols have a significant advantage in that they are much simpler to write. However, in order to gain increased speed, especially over networks, it is desirable to use *full-duplex*, which means that either side is allowed to transmit at any time. This results in significantly more complex code, but can also result in significant speedups over the simpler counterparts. Two general methods of handling full-duplex transfers are to use *windowing* (which has nothing to do with screen displays), or *streaming* techniques. The remaining protocols either use full-duplex by default or have a variation or extension that uses full-duplex.

Note: The common usage of the terms

half-duplex and full-duplex for terminals is quite different and should not be confused with this more technical meaning.



### It Does Windows: WXmodem

Ymodem attempts to address the slow speed of Xmodem by using a longer packet size. This slows down error recovery, though, since it takes longer to retransmit a long packet. It would be nice to be able to get fast transfer rates while still using a small packet size. One way to do this is to use a technique known as *windowing*. The basic idea is that the reason networks slow down file transfers so much is because of the need to wait for the other end. WXmodem (Windowing Xmodem) simply removes the need to wait. It works by having the sender send packets continuously. The receiver receives and checks each one and sends an ACK or NAK as appropriate. In WXmodem the ACK is more than one character since it must identify the packet number as well. The sender matches up each ACK or NAK as it receives it, resending packets that were NAKed and pausing if it gets too far ahead of the receiver. The number of packets that can remain unaccounted for at the sender end before it stops to wait for the receiver is called the window size and explains the term Windowing Xmodem. WXmodem is much faster than Xmodem and can be marginally faster than Ymodem over networks, much faster when there is noise on the line since it is not necessary to resend a long 1024-byte packet.

WXmodem also does some "transparency masking," or encoding, to prevent certain characters from appearing in a packet. After WXmodem builds a data packet, it replaces those characters by two-character sequences starting with DLE (Data Link Escape, although the specific character is unimportant) so those characters can have their usual meanings. In particular, since the WXmodem sender is sending continuously, it may be necessary for the receiver to ask the sender to pause. This is accomplished by using the standard XOFF (to request the sender to pause) and XON (to

request the sender to continue) characters. In order for those characters to be used in that capacity, it is necessary that they not have any meaning in the rest of the transfer. In fact, they are completely ignored by WXmodem except for flow control. This usage of DLE is called *quoting* and is a common technique for encoding characters that aren't allowed to appear in a data packet.

### Chuck Forsberg Strikes Again: Zmodem

After Chuck's YAM program became fairly well-known, he was asked to develop a protocol especially for use over packet-switched networks. He apparently considered adding onto Ymodem but later decided to scrap that completely and start over from scratch. The result is the very impressive, if inappropriately named, Zmodem protocol. The full description of Zmodem is too long to cover here, but a few highlights will suffice.

Zmodem addresses the major shortcomings of Xmodem using a variety of techniques. Any character can be encoded (or *quoted*) in a manner similar to WXmodem to prevent its being used. Several specific characters (including XON and XOFF) are always encoded, and any other character with special meaning to the network can be encoded to prevent problems. It is even possible to use only seven bits by encoding every character over 127. Zmodem uses 16-bit or 32-bit CRCs for error detection, making it an extremely reliable protocol. Every command and control packet includes full error detection so incorrectly transferred control packets can be detected and resent. Zmodem has an impressive array of command packets that allows either side to request one or more file transfers, and can even implement some limited security measures.

Zmodem addresses Xmodem's concern about sequence numbers, file padding and speed by using a full-duplex method of file transfer referred to as *streaming*. The idea here is that the sender simply sends the entire file directly and periodically inserts special packets with cumulative error detection information and current file position. The receiver compares this information when it receives it. If the received information disagrees with what the receiver has calculated, it requests that the sender resend, beginning with a specific file position. By using file position rather than sequence number, Zmodem gains the additional ability to send only part of a file. Zmodem is a fast protocol that is only beginning to gain popularity.

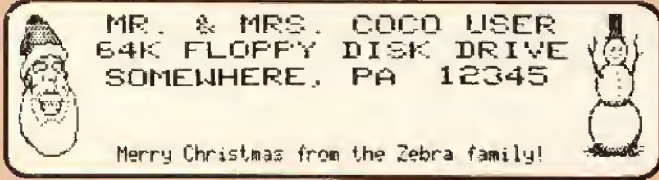
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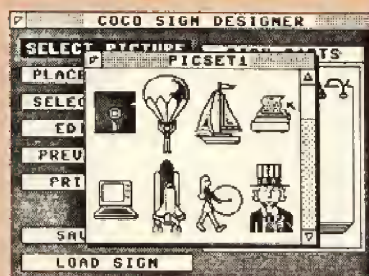
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| SCRIPT .FNT   | SCRIPT2 .FNT | ARCADE .FNT   |  |  |  |
| COMPUTER.FNT  | KIMJ .SGN    | WESTERN .FNT  |  |  |  |
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- Picture Disk #4 120 Holiday Pictures: Christmas, Chanukah, Thanksgiving, New Year's, Easter, Halloween, etc.
- Font Disk A 10 Fonts: Western, Stencil, Banner, Shadow, Variety, Type, Stripes, Digital, Bold3, Object
- Font Disk B 10 Fonts: Arcade, Circle, Alien, Cube, Baroque, Deco, Block, Gray, Computer, Script
- Border Disk #1 Contains 176 High resolution borders, great variety from simple to ornate. (The border disk is for use with the CGDP, but not with the Label Designer).

## Color Paint

Color Paint is an easy to use drawing program for your CoCo 3. It uses the CoCo 3 High resolution 320x200 video mode that allows you to create highly detailed artwork. All the standard features of classic paint programs: lines, rectangles, filled or round cornered rectangles, ovals, paint, spray-can, fill pattern that can be edited, etc. Comes with 11 Hi-res fonts that you can print in any combination of styles: Color, Shadow, Outline, Bold, and Italics! The Deluxe version runs faster and uses the additional memory to implement really exciting features. Color Paint requires a Tandy mouse



or joystick and an inexpensive \$9.95 Tandy Hi-re interface (Catalog #: 26-3028). Prints COLOR using Tandy CGP-220 and OKIMATE-20 printers or in black and white on Tandy DMP 105/ 120/ 130/ 200/ 400, EPSON MX/RX/FX/ printers & compatibles.  
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nect to them through special terminal connections that have unusual limitations in the microcomputer world. In particular many terminal connections have limits on how many characters can be dealt with at a time, are limited to seven bits only, and can only handle a limited number of control characters. In order to transfer files in such very restrictive environments, some people at Columbia University developed the Kermit file transfer protocol, named after the Muppet character. Kermit packets are very short, to avoid line-length limitations on terminal connections. Kermit also supports encoding, which can encode every eight-bit character (*8th bit quoting*) and most control characters. It is even possible to run Kermit where only one control character can be communicated. It has become extremely popular at universities, where it is not uncommon for people to want to transfer files between mainframes and microcomputers. Kermit has an extended handshake when the two sides start up, which determines the way the two sides will communicate, what type of quoting and error checking will be used, and what extensions to the basic protocol each can use. This guarantees that Kermit programs can implement any combination of advanced capabilities and will still be able to communicate as long as they include some basic subset.

Kermit is interesting in that one end of the connection usually runs in the server mode. Once you get the two Kermit programs running, you give commands to the Kermit program at your end (the local Kermit), which passes some of them through to the server Kermit. For example, you can request a directory on the server machine or on your local machine; you can request that files be transferred either way; and you can reconfigure either Kermit program by giving commands to the local Kermit. If your purpose for calling the other machine is to transfer files, this is a very convenient environment.

Unfortunately the extensive encoding causes a lot of overhead, and the very short packet size makes Kermit very slow over networks. There have been many extensions to Kermit that help to address these problems by allowing for longer packet sizes (up to about 9000 bytes) and windowing operation, but these extensions have been slow to catch on.

#### Other Protocols: CIS B, B+

Since the advent of Xmodem nearly 15 years ago, many people have tried to design their own file transfer protocols, with varying degrees of success. Many are just variations of Xmodem, and most never caught on. But two deserve special mention.

CompuServe has done a lot of work to make its system as easy to use as possible. Much of its work has revolved around developing special terminal programs with features carefully matched to their particular needs. As part of this effort it designed a file transfer protocol called CompuServe B protocol, or CIS B. B protocol is a basic receiver-driven, non-windowing protocol. It has two major advantages over Xmodem. First it has a variable packet length, which removes the problems with padding since the last packet can simply be made shorter than the others. Having a variable packet size can also help adaptation to noise since the transfer can use short packets under noisy circumstances to reduce time spent resending (and long packets up to 512 bytes with CIS B for faster transfer under quiet conditions). Secondly when implemented in a particular fashion, the host computer (CompuServe) can initiate any file transfer. This makes it significantly easier to use the system since you simply tell CIS that you want to download a file, and then it tells your terminal program to begin the download. This protocol recently had windowing capabilities added for significantly faster operation, and is now called CIS B+, or Quick-B protocol.

#### Which Is Best for Me?

Which protocol you'll use in a given situation is usually dictated by your terminal program and the system you are calling. Very few CoCo terminal programs offer much more than Xmodem, and protocols more sophisticated than Ymodem are still not widely available. A few points to keep in mind when you do have a choice:

- Xmodem is popular but slow over networks. Almost every terminal program that can do file transfers can do Xmodem, and it is the specified fall-back protocol for Ymodem and Zmodem. The need for a full eight-bit connection can also be prohibitive, especially when working with mainframes.

- Ymodem is much faster than Xmodem over networks but can be slower when there are a lot of errors since it takes so much longer to resend a long packet. Ymodem can use 128-byte packets, but this capability is often not properly implemented. Ymodem does have a batch capability, which can make life much more convenient for people doing lots of file transfers. When the batch capability is fully implemented, it can also avoid problems with padding.

- CompuServe B protocol is better than Xmodem in that it has a variable packet size, which allows for larger packets (and hence greater speed) under non-noisy conditions. It also avoids the problems with Xmodem padding.

- WXmodem is faster than Xmodem. It's marginally more complicated but doesn't offer the batch capabilities of Ymodem. WXmodem is faster than Ymodem in cases where there is both a network delay and noisy conditions and comparable in speed when there is no noise. WXmodem also encodes certain flow-control characters so it can be used in some situations where Xmodem and Ymodem cannot.

- CompuServe B+ protocol is similar to B protocol but offers sliding windows for significantly improved speed.

- Kermit offers eight-bit quoting (a fancy way of saying it can work on seven-bit lines) and is the most popular protocol for transferring files between mainframes and micros. It is the only file transfer protocol available on many mainframes. One version of Kermit written in C is available for OS-9. Kermit has a lot of overhead, though, and its small packet size makes it slow over packet-switched networks unless the sliding window option is implemented, which is rarely done due to the complexity.

- Zmodem seems to be the best all-around, although its complexity means that it's availability to CoCo users will probably be delayed a long time. It is fast and flexible, and it supports batch capabilities.

#### For Further Information

These documents all provide careful descriptions of the corresponding protocol. The Ymodem and WXmodem descriptions include descriptions of standard Xmodem. Some of these are fairly easy to read, and others are slow going. Chuck Forsberg's article describing Ymodem is a particularly good starting point because it gives a good explanation of Xmodem and the sources of error in Xmodem.

Except for the book on Kermit, these articles should be available presently on the major information services (Delphi or CompuServe).

- Peter Boswell, "Xmodem, CRC Xmodem, WXmodem File Transfer Protocols," June 20, 1986.

- CompuServe Incorporated, "VIDTEX 4.0 Standards for Terminal Emulator Programs," April 1985.

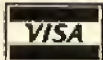
- Frank da Cruz, *Kermit User's Guide*, Columbia University, 6th Edition.

- Frank da Cruz, *Kermit, A File Transfer Protocol*, Digital Press, 1987.

- Chuck Forsberg, editor, *Xmodem/Ymodem Protocol Reference: A Compendium of Documents Describing the Xmodem and Ymodem File Transfer Protocols*, Omen Technology, Inc., May 1985.

- Chuck Forsberg, *The Zmodem Inter-Application File Transfer Protocol*, Omen Technology, Inc., June 1988.





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The CoCo who would be kinged

# The Checkers Champ

by Marc Campbell

**T**hat people are fascinated by games is evident from the wide variety on the market today. There are sophisticated trivia games; complex battle simulation games with armchair generals in command of armies fighting historic battles; and role-playing games that use the imagination for playing pieces and game board. *The Checkers Champ* joins the ranks of these amusements and guarantees you a good time.

*The Checkers Champ* translates the classic board game to bits and bytes of BASIC code. Anyone with a 128K Color Computer 3 and at least one joystick can play. (Those who use Tandy's Deluxe Joystick should set both axis switches to the "free float" position for best results.) *The Checkers Champ* incorporates 320-by-192 resolution graphics and 16 palette colors that

*Marc Campbell, a self-taught programmer, is a student at Ephrata Senior High School. His computing has grown into more than a hobby, as he has seen several of his programs in print and is marketing others through his own software house.*

bring the familiar red and black checkerboard back with style. The program's point-and-click interface makes it incredibly easy to use, even for young children. Devoted checkers players with reservations about this adaptation are needlessly intimidated because computerization brings with it some distinct advantages: You'll never lose any pieces, your sore-loser opponent can't rearrange the board while you pause to answer the telephone, and you don't need a flesh-and-blood friend in order to play. With this program, the Color Computer knows the game like the back of its "hand," and it plays to win.

## Getting Started

Let's play some checkers CoCo style. Fire up the Color Computer 3, connect one or both joysticks, and type in and save the listing. After you've corrected any errors in your typing, you are ready to begin. Type RUN and away you go. You are greeted with a title screen and a short song. (To cut the musical interlude short, hold down any key until the tune stops.) At this point the op-

tions of the game are set. Read each of the onscreen prompts and respond accordingly. If you make a mistake or change your mind after pressing

a key, press the CLEAR key to redo all the options. The title screen vanishes after you have set all the options, and the gameboard is drawn in its place.

## Screen Schematics

Notice the playing screen is divided into five distinct areas. The dialog box, the blue strip located at the top of the screen, is the communications bridge between the computer and the players. Various messages are displayed in the dialog box during the course of the game. The gold box in the upper-left corner of the screen is the scoreboard. The number of games won by black and red players is neatly displayed here. The scoreboard is accurate up to 999 games; 1000 causes it to roll over and begin at 000 again. (While it isn't likely you'll play 1000 games at one sitting, *The Checkers*

|    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|
| XX | 00 | XX | 01 | XX | 02 | XX | 03 |
| 04 | XX | 05 | XX | 06 | XX | 07 | XX |
| XX | 08 | XX | 09 | XX | 10 | XX | 11 |
| 12 | XX | 13 | XX | 14 | XX | 15 | XX |
| XX | 16 | XX | 17 | XX | 18 | XX | 19 |
| 20 | XX | 21 | XX | 22 | XX | 23 | XX |
| XX | 24 | XX | 25 | XX | 26 | XX | 27 |
| 28 | XX | 29 | XX | 30 | XX | 31 | XX |

Note: Blocks marked with XX should be colored red. Do not print the XX. Blocks marked with a number should be colored black. Numbering should be in white.

**Figure 1: Numbering System Used to Designate Checkerboard Blocks**

*Champ's* Score Save feature allows you to keep a running total of all the games you've played. You can have your own ongoing checkers tournament — play a few games,

save the score, and play again later.) The pink box near the bottom of the screen is the menu, from which you can select and perform a variety of functions (like correcting

a mistake or saving a game in progress). The white flag in the lower-right corner of the screen is used when a player wants to cut his losses and surrender. The checkerboard itself is the fifth and last area of the screen.

### It's as Simple as Point-and-Click

What makes *The Checkers Champ* so easy to use is its point-and-click user interface, which means that you tell the computer what to do by positioning the blinking arrow with your joystick and pressing the red firebutton. It's all very obvious once you've given it a try, so do just that. Run the program, and select a

one-player game at whatever level of difficulty you feel comfortable. Make sure Red goes first.

Take a look at the dialog box. You see the message SELECT YOUR PIECE in red print. The red print indicates that it is Red's turn; on Black's turn the print in the dialog box is black. There is only one exception to this red print/black print rule: Whenever you receive a SYSTEM MESSAGE (one that doesn't directly involve the game), the print shows up as dark blue.

Point the blinking arrow at the piece you want to move and hold down the red firebutton until you hear a high-pitched beep. The message in the dialog box should change to MAKE YOUR MOVE. If you click on the wrong piece or change your mind after selecting a piece, jump down to the Oops block on the menu and press the button. You may now select another piece. Once you have selected a piece and are ready to move, point the arrow to where you want the piece to move and click again. Keep in mind that Oops will not backtrack a bad move; once you've clicked with "Make your move" in the dialog box, the move is permanent. Habitual checkers cheaters won't have any luck pulling the wool over the Color Computer's eyes. If and when you click on an illegal block (i.e., one that is occupied, one that is non-adjacent, or one that is red in color), a buzzer sounds and you must reselect the piece you want to move. (Players with devious intent will be embarrassed whenever they sound the buzzer.)

After your move the dialog box displays the message THINKING... in black print, indicating that it is now Black's turn. The computer decides which piece to move by looking at all the different possibilities and selecting the best move. Naturally the level of difficulty you selected has a bearing on whether a move is deemed advantageous or disadvantageous. Generally speaking, the higher the level of difficulty, the longer you have to wait while the computer processes its move (about 30 seconds tops).

### Jumping

Treat a jump just like any other move; click where you want your piece to go. Your opponent's checker vanishes as yours leaps to its new location.

After you jump one of your opponent's pieces, the computer checks to see if another jump can be made from the new position. The dialog box reads CONTINUE YOUR JUMP if this is possible. As usual, click in the block where you want the jump to continue. Do not reselect the piece that is jumping or you'll lose the extra move. The traditional rules of checkers say that you don't have to continue a jump. Therefore,

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no matter what strategic trick you have up your sleeve, click on Oops or any illegal block to forfeit the additional jump.

### King Me!

A normal piece becomes a king when it successfully moves all the way across the board without being removed by an opponent. As anyone who has ever lost to an uncontrolled king population knows, kings can move and jump in any direction. After a piece is kinged in *The Checkers Champ*, a short coronation ceremony interrupts the game temporarily. Kinged pieces are marked with a yellow crown.

As an option, you may choose to play an all-king version. This game variation is something of a house rule that found its genesis when I became bored with garden-variety checkers. The game begins with all pieces as kings. Be prepared for some wild multidirectional jumps once things get going.

### Waving The White Flag

If your opponent traps you so masterfully that you cannot make a move, or if you move the arrow to the white flag in the bottom right corner of the screen, the arrow disappears as it exits the checkerboard, and the white flag begins to wave. A click while the flag is waving causes the dialog box to ask if you're sure you want to throw in the towel. Pressing any key other than Y sends you back to the game; simply move the arrow away from the white flag and back onto the checkerboard. Pressing the Y key automatically makes your opponent the winner.

### Winning The Game

To win the game you must eliminate all your opponent's checkers, either by jumping them or cornering them so they can't move. Prompts ask you to select between playing another game or shutting down for the evening.

### The Menu

To select an item from the menu, position the arrow anywhere in the block that contains the item and click. There are four items up for grabs on the menu:

**Oops:** Allows you to reselect the piece you wish to move. This item is explained in more detail above.

**Stat:** Returns the number of pieces each player has remaining. Click on Stat to see at a glance who's winning.

**Save:** Saves a game in progress to tape or disk. Prompts guide you every step of the way to ensure the game is saved properly.

| Direction    | Number | P AND 4 | Formula |
|--------------|--------|---------|---------|
| Top Right    | 0      | 0       | P-3     |
| Top Right    | 0      | 4       | P-4     |
| Top Left     | 1      | 0       | P-4     |
| Top Left     | 1      | 4       | P-5     |
| Bottom Right | 2      | 0       | P+5     |
| Bottom Right | 2      | 4       | P+4     |
| Bottom Left  | 3      | 0       | P+4     |
| Bottom Left  | 3      | 4       | P+3     |

Figure 2: Determining Neighbors With Boolean Formulas

If you click on this item accidentally, press CLEAR when the dialog box reads SAVE TO (1) DISK or (2) CASSETTE. There is no turning back afterwards, so think a little before pressing a key. The only time you cannot save a game is when you are in the middle of a multiple jump. Finish the jump first, then save it. It may be advantageous to save an important game two or three times, either under different filenames or, better yet, on separate disks or tapes.

**Quit:** Ends the game if you press the Y key when asked if you are sure you want to call it quits. Any other key sends you back to the game in progress. You have the option of saving the score before the program stops.

### Installing Scores

If needed you can load the score of a previous checkers tournament at the beginning of the playing session. If you do not have a separate score file saved, you can enter the filename of a saved game with the score you want installed. In this case, the computer looks only at the score and disregards the rest of the information.

### Error Trapping: Disk

If, in the course of your game saving and loading enterprises, you happen to come upon this message: ERROR PRESS ANY KEY TO CONTINUE, the computer is telling you that something is wrong. Most likely a bad filename, a write-protection tab, or a full disk is at fault. Save the game to another disk, and don't press ENTER without specifying a filename when asked for one. Game Load errors are generally more fatal. The game file or, even worse, the disk directory

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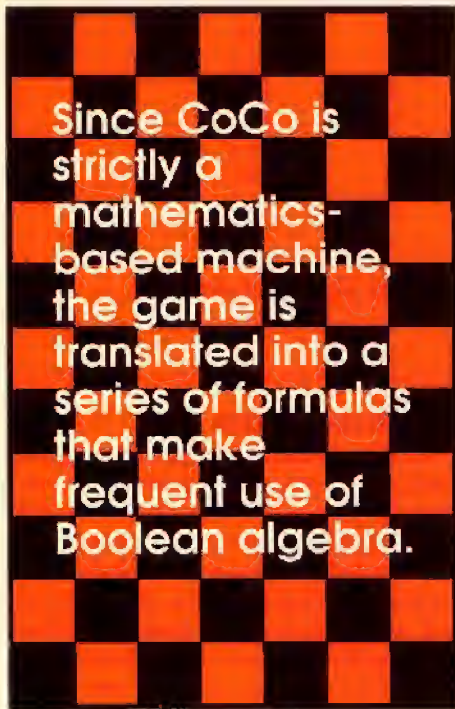
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or entire disk may be garbled. Before jumping to any conclusions, check to make sure the filename is correct and the disk in Drive 0 contains the file.



### Error Trapping: Cassette

You should never receive an error message while saving a game. Errors received while loading are caused by bad data, but retry the load a few times at various recorder volume settings before giving up on the saved file.

### Error Trapping: Otherwise

The *Checkers Champ* should report only errors caused by the Game, Save and Load procedures. If the error message pops up unexpectedly, the listing may have a typing error. Debuggers should eliminate the ON ERR GOTO, POKE41598,32, and POKE 41599,32 portions of Line 1 to cripple the error-trapping and break-disabling routines. Once the program is debugged, you can add the deleted segments.

### Technically Speaking . . .

Teaching a person to play checkers is one thing, but teaching a computer to do the same is a different story. Since CoCo is strictly a mathematics-based machine, the game is translated into a series of formulas that make frequent use of Boolean algebra (the logical operators AND, NOT and OR; see your Color Computer user's manual or a high school mathematics textbook for further information). Each of the 32 "legal" boxes on the gameboard is assigned a number, ranging from zero in the upper left corner to 31 in the lower right (see Figure 1). From any given block, there are as many

|    |       |     |     |       |     |
|----|-------|-----|-----|-------|-----|
| 7  | ..... | 152 | 162 | ..... | 134 |
| 12 | ..... | 233 | 174 | ..... | 194 |
| 22 | ..... | 162 | 187 | ..... | 119 |
| 29 | ..... | 25  | 204 | ..... | 56  |
| 40 | ..... | 228 | 213 | ..... | 87  |
| 47 | ..... | 221 | 226 | ..... | 240 |
| 60 | ..... | 176 | END | ....  | 146 |

### The listing: CHECKERS

```

0  *THE CHECKERS CHAMP COPYRIGHT
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   * COPYRIGHT 1989 FALSOFT, INC
1  WIDTH32:CLS0:POKE41598,32:POKE
   41599,32:X=RND(-TIMER):X=0:POKE1
   40,0:POKE&HFFD9,0:POKE&HF015,&H2
   1:HBUFF1,14:HBUFF2,269:ES="01L16
   C":B$="05L32C":DIMP(31,1):DIMA(1
   1):DIMB(11):DIMC(11):DIMD(11):DI
   MBL(31):ONERRGOTO227
2  RGB:PALETTE0,0:PALETTE9,35:PAL
   ETTE10,53:PALETTE11,52:PALETTE12
   ,0:PALETTE13,39:PALETTE14,57:PAL
   ETTE15,19
3  X=0:HCOLOR,8:HSCREEN2
4  DATA03L12G,L604C,L1203G,L604C,
   L1203G,L3.04C,L1203G,L1204C,L16D
   ,L12E,L16D,C,L6E,L12C,L6D,L3CP6,
   L6C,L8E,E,L4E,L6C,L8E,E,L4E,L6C,
   L8E,E,L6E,L10D#.D.L3C#.03G.04L8E
   ,E,L6E,L12C,L6D,C.03C.02C
5  HCOLOR4:FORQ=0T0304STEP20:HLIN
   E(0,0)-(0+20,15),PSET,B:HLINE(0,
   105)-(0+20,120),PSET,B:IFX=0THEN
   HPAINT(Q+1,1),3,4:HPAINT(Q+1,106
   ),12,4:X=1ELSEHPAINT(Q+1,106),3,
   4:HPAINT(Q+1,1),12,4:X=0
6  NEXT:FORQ=15T090STEP15:HLINE(0
   ,0)-(20,Q+15),PSET,B:HLINE(300,Q
   )-(320,Q+15),PSET,B:IFX=1THENHPA
   INT(1,Q+1),3,4:HPAINT(301,Q+1),1
   2,4:X=0ELSEHPAINT(301,Q+1),3,4:H
   PAINT(1,Q+1),12,4:X=1
7  NEXT:HCOLOR1:HPRINT(5,3),"T H
   E":HPRINT(26,9),"C H A M P":HCOL
   OR4:HDRAW"BM50,31R20D10L20G5D10F
   5R20D10L25H10U20E10R5:BM70,31D40
   R10U15R10D15R10U40L10D15L10U15L1
   0:BM100,31D40R30U10L20U8R10U4L10
   UBR20U10L30:BM145,31R20D10L20G5D
   10F5R20D10L25H10U20E10R5"
8  HDRAW"BM165,31D40R10U10F10R10H
   15U10E15L10G10U10L10:BM195,31D40
   R30U10L20U8R10U4L10U8R20U10L30:B
   M225,31D40R10U10F10R10H15U5R10E5
   U10H5L40BR25D5R10F3D4G3L10U10:B
   M255,36E5R25D10L15G5R15F5D15G5L2
   5U10R15E5L15H5U5"
9  FORQ=48T0273STEP+30:IFX=0THENH
   PAINT(Q,35),3,4:X=1ELSEHPAINT(Q,
   35),12,4:X=0
10 NEXT:HCOLOR5:HPRINT(4,11),"(C
   ) MCMLXXXVIII by Marc Campbell"
11 POKE&HFFD8,0:FORQ=1T040:READA
   $:PLAYA$:IFINKEY$<>"THENQ=40:NE
   XTELSEIFX=0THENPALETTE12,36:PALE
   TTE3,0:X=1:NEXTELSEPALETTE12,0:P
   ALETTE3,36:X=0:NEXT:EXEC43345
12 EX=1:EY=22:POKE&HFFD9,0:PALET
   TE0,0:PALETTE3,36:PALETTE12,0:HCO
   LOR11:HPRINT(5,16),"PRESS CLEAR
   TO RESTART OPTIONS":HCOLOR4:HPR
   INT(0,18),"Do you want to load a
   saved game? (Y/N)"
13 GOSUB226:PLAYB$:HPRINT(0,18),
   STRING$(40,32):IFAS="Y"ORAS="y"
   THEN14ELSE18
14 HCOLOR4:HPRINT(3,18),"Load fr
   om (1) disk or (2) cassette"
15 GOSUB226:IFAS<>"1"ANDAS<>"2"
   THENPLAYE$:GOTO15ELSEPLAYB$:IFAS=
   "1"THEND=1ELSED=-1
16 X=3:Y=20:GOSUB156:HPRINT(5,22
   ),"Press any key to load the gam
   e":EXEC44539:POKE&HFFD8,0:OPEN"I
   ",#D,F$
17 FORX=1TOEOF(D):INPUT#D,NG(0),
   NG(1):FORQ=0T011:INPUT#D,A(Q),B(
   Q),C(Q),D(Q):NEXTQ:INPUT#D,TN,NP
   ,IT,GM,J(0),J(1):NEXTX:CLOSE#D:P
   OKF&HFFD9,0:GOTO38
18 HCOLOR1:HPRINT(0,18)," Do yo
   u want to install scores? (Y/N)"
19 GOSUB226:PLAYB$:IFAS="Y"ORAS=
   "y"THEN20ELSE24
20 HCOLOR4:HPRINT(2,18)," Load f
   rom (1) disk or (2) cassette "
21 GOSUB226:IFAS<>"1"ANDAS<>"2"
   THENPLAYE$:GOTO21ELSEPLAYB$:IFAS=
   "1"THEND=1ELSED=-1
22 X=3:Y=20:GOSUB156:HPRINT(4,22
   ),"Press any key to load the sco
   res":EXEC44539:POKE&HFFD8,0:OPEN
   "I",#D,F$
23 FORX=1TOEOF(D):INPUT#D,NG(0),
   NG(1):NEXTX:CLOSE#D:POKE&HFFD9,0
   :GOSUB222
24 HCOLOR13:HPRINT(2,18),"Press
   1 for Player One vs CoCo Champ":
   HPRINT(2,20),"Press 2 for Player
   One vs Player Two"
25 GOSUB226:IFAS<>"1"ANDAS<>"2"
   THENPLAYE$:GOTO25ELSEPLAYB$:IFAS=
   "1"THENNP=1ELSENP=2
26 IFNP=2THEN28ELSEHCOLOR10:GOSU
   B222:HPRINT(4,18),"How smart is
   the Checkers Champ?":HPRINT(11,2
   0),"1 DULL-WITTED":HPRINT(11,
   21),"2 RUN-OF-THE-MILL":HPRINT(
   11,22),"3 DEVESTATING"
27 GOSUB226:IFAS<>"1"ANDAS<>"2"
   ANDAS<>"3"THENPLAYE$:GOTO27ELSEPL
   AYR$:TFA$="1"THENIT=1ELSEIFAS="2
   "THENIT=2ELSEIFAS="3"THENIT=3
28 GOSUB222:HCOLOR14:HPRINT(4,18
   ),"Press 1 to play classic check
   ers":HPRINT(4,20),"Press 2 to pl
   ay all king version"

```

```

29 GOSUB226:IFAS<>"1"ANDA$<>"2"
HENPLAYE$:GOTO29ELSEPLAYB$:IFAS=
"1"THENGM-1ELSEGM-2
30 GOSUB222:HCOLOR15:HPRINT(4,18)
,"Player 1: RED RIGHT JOYST
ICK"
31 IFNP=1THENHPRINT(4,19),"Playe
r 2: BLACK COLOR COMPUTER"
32 IFNP=2THENHPRINT(4,19),"Playe
r 2: BLACK LEFT JOYSTICK"
33 HPRINT(3,20),STRING$(34,32):H
PRINT(3,21),"Who goes first? (1)
RED (2) BLACK":HPRINT(19,22),"
(3) COMPUTER PICKS"
34 GOSUB226:IFA$<>"1"ANDA$<>"2"AN
DA$<>"3"THENPLAYE$:GOTO34ELSEPL
AYB$:IFA$="1"THENTN=0ELSEIFA$="2
"THENTN-1ELSEIFA$="3"THENTN=RND(
2)-1
35 J(0)=0:J(1)=0:FORQ=0TO11:A(Q)
=Q:B(Q)=Q+20
36 IFGM=2THENC(Q)=2:D(Q)=2ELSEC(
Q)=0:D(Q)=0
37 NEXT
38 EX=1:EY=0:POKE&HF015,&HAA:HCO
LOR,8:HSCREEN2
39 HCOLOR5:HLINE(2,0)-(319,7),PS
ET,BF:HCOLOR2:HLINE(1,1)-(1,8),P
SET:HLINE-(318,8),PSET:HLINE(0,2
)-(0,9),PSET:HLINE-(317,9),PSET
40 HCOLOR9:HLINE(64,183)-(256,19
1),PSET,BF:HCOLOR10,8:HPRINT(9,2
3),"00PS STAT SAVE QUIT":FORQ
=112TO208STEP48:HLINE(Q,183)-(Q,
191),PSET:NEXT
41 HCOLOR11:HLINE(2,16)-(39,66),
PSET,BF:HCOLOR7:HLINE(1,17)-(1,6
7),PSET:HLINE-(38,67),PSET:HLINE
(0,18)-(0,68),PSET:HLINE-(37,68)
,PSET:HCOLOR8:HLINE(4,18)-(37,28
),PSET,BF:HCOLOR3:HLINE(4,43)-(3
7,53),PSET,BF
42 HCOLOR4:HLINE(280,150)-(318,1
60),PSET:HLINE-(280,170),PSET:HL
INE-(280,150),PSET:HPRINT(281,15
2),4,4:HCOLOR11:HLINE(280,171)-(
280,185),PSET
43 HCOLOR7:X=LEN(STR$(NG(1))):HP
RINT(1,4),STRING$(4-X,48)+RIGHT$(
STR$(NG(1)),X-1):X=LEN(STR$(NG(
0))):HPRINT(1,7),STRING$(4-X,48)
+RIGHT$(STR$(NG(0)),X-1)
44 POKE&HF015,&H21:PALETTE0,27:H

```

```

COLOR4:X=0:Z=0:FORR=16TO156STEP2
0
45 FORC=48TO244STEP28
46 HLINE(C,R)-(C+28,R+20),PSET,B
:IFX=0THENHPRINT(C+1,R+1).3.4:X=
1ELSEX=0
47 NEXTC:IFX=0THENX=1ELSEX=0
48 NEXTR
49 X=76:W=244:Y=16:FORQ=0TO31:BL
(Q)=0:P(Q,0)=X:P(Q,1)=Y:X=X+56:IF
X>W THENY=Y+20:IFZ=0THENX=48:W=
216:Z=1ELSEZ=0:X=76:W=244
50 NEXT
51 FORQ=0TO11:IFA(Q)=-2THEN52ELS
EBL(A(Q))=2:W=P(A(Q),0)+14:X=P(A
(Q),1)+10:HCIRCLE(W,X),10:IFC(Q)
=-2THENDRAW"BM"+STR$(W+2)+", "+ST
R$(X+2)+"C1L8U6F4E2F2E4D6L8C4":H
PAINT(W+2,X+1),1,1
52 IFB(Q)=-2THEN53ELSEBL(B(Q))=1
:Y=P(B(Q),0)+14:Z=P(B(Q),1)+10:HC
IRCLE(Y,Z),10:HPRINT(Y,Z),3,4:IF
D(Q)=-2THENDRAW"BM"+STR$(Y+2)+",
 "+STR$(Z+2)+"C1L8U6F4E2F2E4D6L8
C4":HPRINT(Y+2,Z+1),1,1
53 NEXT
54 GOSUB129:GOSUB89:GOTO163
55 HPRINT(1,0),"Select your piec
e"+STRING$(23,32):GOSUB83
56 IFBUTTON(TN*2)=1THENGOSUB135:
GOTO57ELSE54
57 FORQ=0TO31:IFX>P(Q,0)ANDX<P(Q
,0)+28ANDY>P(Q,1)ANDY<P(Q,1)+20T
HEN58ELSENEXT:PLAYE$:GOTO54
58 P=0:IFTN=1THEN59ELSEFORQ=0TO1
1:IFB(Q)=P THENN=Q:GOTO60ELSENEXT
:PLAYE$:GOTO54
59 FORQ=0TO11:IFA(Q)=P THENN=Q:G
OTO60ELSENEXT:PLAYE$:GOTO54
60 GOSUB89:HPRINT(1,0),"Make you
r move"+STRING$(26,32):GOSUB83
61 IFBUTTON(TN*2)=1THENGOSUB135:
GOTO62ELSE60
62 FORQ=0TO31:IFX>P(Q,0)ANDX<P(Q
,0)+28ANDY>P(Q,1)ANDY<P(Q,1)+20A
NDBL(Q)=0THEN63ELSENEXT:PLAYE$:G
OTO54
63 M=Q
64 IFTN=1 ANDC(N)<>2 THEN71
65 IFJ>0THEN68
66 IF(P AND4)=4 THENIFP-M=5 ANDI
NT(P/4)<>P/4 ORP-M=4THEN77
67 IFP-M=3 AND(P AND4)=0ORP-M=4T

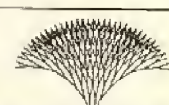
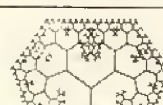
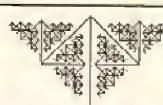
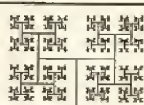
```

as four blocks surrounding it. Assuming that P represents the number of the blocks being examined, we can determine its neighbors with the Boolean algebra formulas mentioned previously (see Figure 2).

Of course there is an exception to every rule. Our formulas do not yield accurate results when a block at the very edge of the board is examined simply because there aren't four possible directions in which to move.

We must test P by ANDING 4 because only diagonal moves are allowed on the checkerboard. To demonstrate this concept, let's take a look at how we arrived with our system of eight formulas. Find Block 9 in Figure 1. Notice that 5, 6, 13 and 14 are the only possible moves a piece in Block 9 can make without jumping. We derive four formulas from our observations:  $9-6=3$  (P-3 in the top right),  $9-5=4$  (P-4 in the top left),  $14-9=5$  (P+5 in the bottom right), and  $13-9=4$  (P+4 in the bottom left). We really ought to test a few other blocks just to see if our formulas are universal, so why not 26? Fortunately for us, we still get Block 26's neighbors when we plug in the numbers: 23(P-3), 22(P-4), 31(P+5), and 30(P+4). To prove that we are bona fide mathematicians, we'll try 14 for good measure. Our formulas spit out 11(P-3), 10(P-4), 19(P+5), and 18(P+4). Only 10 and 18 are adjacent; they do not even fit the pattern of top right, top left, bottom right and bottom left. Now what do we do?

Here is where staggering rows comes into play. Since every other row is offset, we need two sets of formulas. Which set of formulas should be used? It just so happens that every block in a row beginning with a multiple of eight equals zero when ANDed with four. Also, every block in a row that does not begin with a multiple of eight equals four when ANDed with four. This is a neat, sure-fire method of finding the neighbors of any block in any row on any standard checkerboard. White it's much more



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practical for human beings to simply scrutinize a checkerboard to look for moves, all this Boolean is right up the Color Computer's alley.

The computer decides which move to make by looking at each of its remaining pieces and all the possible moves each piece can make. Each move is assigned a priority value and poked into Lo-Res graphics screen memory; naturally the higher the priority, the better chance the move in question is chosen. Depending on the level of difficulty, the computer determines a move's priority based on whether or not a piece can jump, be kinged, or block a possible jump.

After all the possible moves are evaluated and their priorities tabulated, the computer chooses the move with the highest priority. In the event that two or more moves have the same priority, one of them is randomly selected.

This explanation barely skims the surface of the fascinating subject of artificial intelligence. As you may suspect, there is much more going on inside your Color Computer when *The Checkers Champ* "thinks." If you are still intrigued, dissect the program listing on your own or drop me a line.

### Variables List

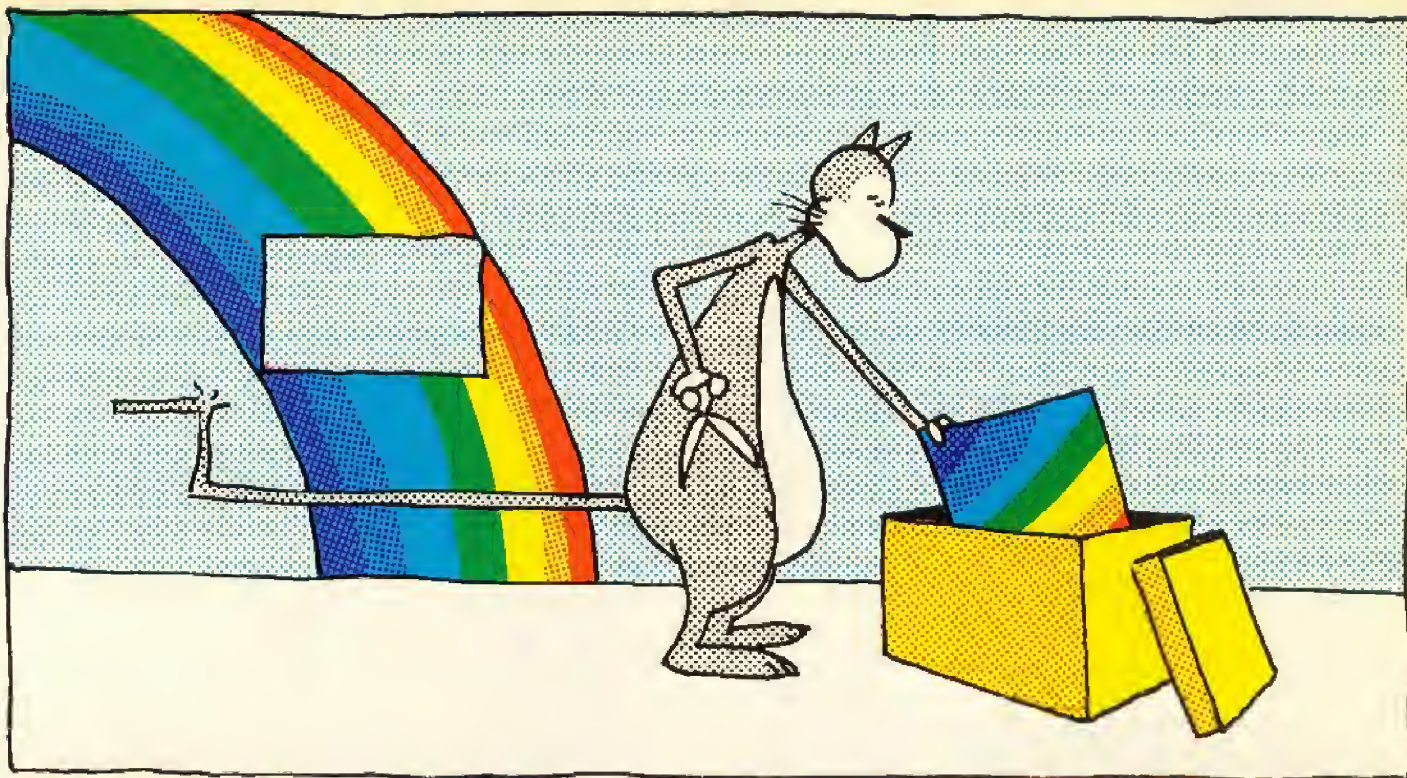
|       |  |
|-------|--|
| A\$   | Dummy string   |
| A(X)  | Array containing location of Black #X                                      |
| B\$   | PLAY string containing beep tone   |
| B(X)  | Array containing location of Red #X  |
| BK    | Memory location of stored moves to block potential jumps                   |
| BL(X) | Array containing block's status: 0=empty, 1=Red-occupied, 2=Black-occupied |
| C     | Dummy variable   |
| C(X)  | Returns a 2 if Black #X is a king  |
| D     | Device number being accessed   |
| D(X)  | Returns a 2 if Red #X is a king  |
| E\$   | PLAY string containing error tone  |
| EX    | x coordinate of error message  |
| EY    | y coordinate of error message  |
| F\$   | String containing filename   |
| F     | Dummy variable   |
| GM    | Returns a 1 if regular checkers, a 2 if all-king version                   |
| GR    | Returns a 1 if score is being saved  |
| IT    | Level of difficulty (1-3)  |
| J     | Returns a 1 if move is a jump  |
| J(X)  | Array containing number of jumps (Red=X=0; Black=X=1)                      |
| M     | Block to which a piece is moving   |
| ML    | Memory location where computer searches for possible blocks                |
| MP    | Memory location where current move is stored                               |

```

HEN77
68 IFF-M=9 AND(P AND4)<>((P-4)AN
D4) ANDINT(P/4)<>P/4 THEN90
69 IFF-M=7THEN90
70 IFTN=0AND D(N)<>2 THENPLAYE$:
GOTO54
71 IFJ>0THEN74
72 IF(M AND4)=4 THENIFM-P=5 ANDI
NT(M/4)<>M/4 ORM-P=4THEN77
73 IFM-P=3 AND(M AND4)=0ORM-P=4T
HEN77
74 IFM-P=9 AND(M AND4)<>((M-4)AN
D4) ANDINT(M/4)<>M/4 THEN90
75 IFM-P=7THEN90
76 PLAYE$:GOTO54
77 HGET(P(P,0)+1,P(P,1)+1)-(P(P,
0)+27,P(P,1)+19),2:HCOLOR8:HLIN
E(P(P,0)+1,P(P,1)+1)-(P(P,0)+27,P
(P,1)+19),PSET,BF:HPUT(P(M,0)+1,
P(M,1)+1)-(P(M,0)+27,P(M,1)+19).
2,PSET:HCOLOR4:EXEC43345
78 IFJ(TN)=12THEN146
79 IFTN=0ANDM>-1ANDM<4ANDD(N)<>2
THEND(N)=2:GOSUB151
80 IFTN=1ANDM>27ANDM<32ANDC(N)<>
2THENC(N)=2:GOSUB151
81 IFTN=0THENB(N)=M:BL(P)=0:BL(M
)=1:IFJ>0THEN104ELSETN=1:GOTO54
82 IFTN=1THENA(N)=M:BL(P)=0:BL(M
)=2:IFJ>0THEN104ELSETN=0:GOTO54
83 QX=JOYSTK(0):QX=JOYSTK(1):X=5
0+JOYSTK(TN*2)*3.5:Y=18+JOYSTK(T
N*2+1)*2.5:X=INT(X):Y=INT(Y)
84 IFY=175 THENY=185:IFX>253THEN
X=253ELSEIFX<64THENX=64
85 IFY>145ANDX=270THENF=1:HCOLOR
4,8:HLINE(280,150)-(318,160),PRE
SET:HLINE-(280,170),PSET:HSET(
280,170,11):FORQ=1TO100:NEXT:HLI
NE(280,150)-(318,160),PSET:HLIN
E-(280,170),PSFT:GOTO88
86 F=0:HGET(X,Y)-(X+4,Y+4),1:HDR
AW"C1BM"+STR$(X)+" "+STR$(Y)+"NR
2ND2F4C4":FORQ=1TO50:NEXT:HPUT(X
,Y)-(X+4,Y+4),1,PSET
87 HPUT(X,Y)-(X+4,Y+4),1.PSET
88 RETURN
89 IFTN=0THENHCOLOR3:RETURNELSEH
COLOR8:RETURN
90 J=1:FORQ=0TO11
91 IFTN=0THENOP=A(Q)ELSEIFTN=1TH
ENOP=B(Q)
92 IFTN=1 ANDC(N)<>2 THEN98
93 IFF-M=7 AND(P AND4)=4 AND P-4
=OP THENX=OP:GOSUB154:GOTO103
94 IFF-M=7 AND(P AND4)=0 AND P-3
=OP THENX=OP:GOSUB154:GOTO103
95 IFF-M=9 AND(P AND4)=4 ANDP-5=
OP THENX=OP:GOSUB154:GOTO103
96 IFF-M=9 AND(P AND4)=0 ANDP-4=
OP THENX=OP:GOSUB154:GOTO103
97 IFTN=0 ANDD(N)<>2 THEN102
98 IFM-P=7 AND(M AND4)=4 AND M-4
=OP THENX=OP:GOSUB154:GOTO103
99 IFM-P=7 AND(M AND4)=0 AND M-3
=OP THENX=OP:GOSUB154:GOTO103
100 IFM-P=9 AND(M AND4)=4 ANDM-5=
OP THENX=OP:GOSUB154:GOTO103
101 IFM-P=9 AND(M AND4)=0 ANDM-4
=OP THENX=OP:GOSUB154:GOTO103
102 NEXT:J=0:PLAYE$:GOTO54
103 J(TN)=J(TN)+1:HCOLOR8:HLIN
E(P(X,0)+1,P(X,1)+1)-(P(X,0)+27,P(
X,1)+19),PSET,BF:GOTO77
104 P=M:FORQ=0TO3:PP(QX)--10:PJ
(QX)--10:NEXT:IFTN=1AND C(N)<>2
THEN108
105 IF(P AND4)=4 THENPP(0)=P-4:I
F((P-5)AND4)=((P-4)AND4)THENPP(1
)-P-5
106 IF(P AND4)=0 THENPP(1)=P-4:I
FINT((P-3)/4)<>(P-3)/4THENPP(0)=
P-3
107 IFTN=0AND D(N)<>2 THEN111
108 IF(M AND4)=4 THENPP(2)=M+4:I
F((M+3)AND4)=((M+4)AND4)THENPP(3
)=M+3
109 IF(M AND4)=0 THENPP(3)=M+4:I
FINT((M+5)/4)<>(M+5)/4THENPP(2)=
M+5
110 IFTN=1 AND C(N)<>2 THEN114
111 IF(PP(0)AND4)=4 THENPJ(0)=PP
(0)-4:IF((PP(1)+5)AND4)<>(PP(1)A
ND4)THENPJ(1)=PP(1)-5
112 IF(PP(0)AND4)=0 THENPJ(1)=PP
(1)-4:IF((PP(0)-3)AND4)<>(PP(0)A
ND4)THENPJ(0)=PP(0)-3
113 IFTN=0AND D(N)<>2 THEN116
114 IF(PP(2) AND4)=4 THENPJ(2)=P
P(2)+4:IF((PP(3)+3)AND4)=((PP(3)
+4)AND4)THENPJ(3)=PP(3)+3
115 IF(PP(2) AND4)=0 THENPJ(3)=P
P(3)+4:IFINT((PP(2)+5)/4)<>(PP(2
)+5)/4THENPJ(2)=PP(2)+5
116 GOSUB131
117 FORQ=0TO3:PB(Q)=0:NEXT:FORQX
=0TO3
118 IFPJ(QX)<0THENPB(QX)=1ELSEIF
BL(PJ(QX))>0THENPB(QX)=1
119 NEXTQX
120 IFTH=1THENRETURN
121 IF PB(0)=0 OR PB(1)=0 OR PB(
2)=0 OR PB(3)=0 THEN122ELSE54
122 FORQX=0TO3:IFPP(QX)--1THEN12
6
123 IFTN=0THENIFBL(PP(QX))=2 AND
PB(QX)=0 THEN127
124 IFTN=1THENIFBL(PP(QX))=10 TH
ENBL(PP(QX))=1
125 IFTN=1THENIFBL(PP(QX))=1 AND
PB(QX)=0 THEN127
126 NEXTQX:GOTO54
127 GOSUB89:IFTH=2THEN219ELSEHPR
INT(1,0),"Continue your jump"+STR
ING$(21,32)
128 GOSUB83:IFBUTTON(TN*2)-1THEN
GOSUB135:GOTO62ELSE128
129 IFJ=0THENRETURNELSEIFTN=0THE
NTN=1ELSETN=0
130 J=0:RETURN
131 FORQX=0TO3:IFPJ(QX)<0 ORPJ(Q
X)>31 THENPJ(QX)--1
132 NEXT
133 FORQX=0TO3:IFPP(QX)<0OR PP(Q
X)>31THENPP(QX)--1
134 NEXT:RETURN
135 PLAYB$:IFY<185ANDF=0THENRETU
RN
136 IFF=0THEN138ELSEF=0:GOSUB89:
HPRINT(1,0),"Are you sure you wa
nt to surrender?":EXEC44539:A$=I
NKEY$:PLAYB$:IFA$<>"Y"ANDA$<>"y"
THEN54
137 IFTN=0THENTN=1:GOTO146ELSETN
=0:GOTO146
138 IFX>63ANDX<112THEN54
139 IFX>111ANDX<160THENHCOLOR2:M
$="Red:"+STR$(12-J(1))+ " Black:
"+STR$(12-J(0)):M$=M$+STRING$(39
-LEN(M$),32):HPRINT(1,0).M$:GOSU

```





# HOW DO YOU GIVE A RAINBOW?

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## How To Read Rainbow

When we use the term CoCo, we refer to an affectionate name that was first given to the Tandy Color Computer by its many fans, users and owners.

The BASIC program listings printed in THE RAINBOW are formatted for a 32-character screen — so they show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little disk and/or cassette symbols on the table of contents and at the beginning of articles indicate that the program is available through our RAINBOW ON DISK or RAINBOW ON TAPE service.

## Using Machine Language

The easiest way to "put" a machine language program into memory is to use an editor/assembler, a program you can purchase from a number of sources. All you have to do, essentially, is copy the relevant instructions from THE RAINBOW's listing into CoCo.

Another method of putting an ML listing into CoCo is called "hand assembly" — assembly by hand, which *sometimes* causes problems with ORIGIN or EQUATE statements. You ought to know something about assembly to try this.

Use the following program if you want to hand-assemble ML listings:

```
10 CLEAR200,&H3F00:I=&H3FB0
20 PRINT "ADDRESS: ";HEX$(I)
30 INPUT "BYTE":B$
40 PDKE I, VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the &H3F00 in Line 10 to &H7F00 and change the value of I to &H7FB0.

## OS-9 and RAINBOW ON DISK

The OS-9 side of RAINBOW ON DISK contains two directories: CMDS and SOURCE. It also contains a file, *read.me.first*, which explains the division of the two directories. The CMDS directory contains executable programs and the SOURCE directory contains the ASCII source code for these programs. BASIC09 programs will only be offered in source form so they will only be found in the SOURCE directory.

OS-9 is a very powerful operating system. Because of this, it is not easy to learn at first. However, while we can give specific instructions for using the OS-9

programs, you will find that the OS-9 programs will be of little use unless you are familiar with the operating system. For this reason, if you haven't "learned" OS-9 or are not comfortable with it, we suggest you read *The Complete Rainbow Guide to OS-9* by Dale Puckett and Peter Dibble.

The following is not intended as a course in OS-9. It merely states how to get the OS-9 programs from RAINBOW ON DISK to your OS-9 system disk. Use the procedures appropriate for your system. Before doing so, however, boot the OS-9 operating system according to the documentation from Radio Shack.

- 1) Type `load dir list copy` and press ENTER.
- 2) If you have only one disk drive, remove the OS-9 system disk from Drive 0 and replace it with the OS-9 side of RAINBOW ON DISK. Then type `chd/d0` and press ENTER. If you have two disk drives, leave the system master in Drive 0 and put the RAINBOW ON DISK in Drive 1. Then type `chd/d1` and press ENTER.
- 3) List the `read.me.first` file to the screen by typing `list read.me.first` and pressing ENTER.
- 4) Entering `dir` will give you a directory of the OS-9 side of RAINBOW ON DISK. To see what programs are in the CMDS directory, enter `dir cmds`. Follow a similar method to see what source files are in the SOURCE directory.
- 5) When you find a program you want to use, copy it to the CMDS directory on your system disk with one of the following commands:

One-drive system: `copy /d0/cmds/ filename /d0/cmds/ filename -s`

The system will prompt you to alternately place the source disk (RAINBOW ON DISK) or the destination disk (system disk) in Drive 0.

Two-drive system: `copy /d1/cmds/ filename /d0/cmds/ filename`

Once you have copied the program, you execute it from your system master by placing that disk in Drive 0 and entering the name of the file.

## The Rainbow Seal



The *Rainbow Certification Seal* is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product that carries the Seal has actually been seen by us, that it does, indeed, exist and that we have a sample copy here at THE RAINBOW.

Manufacturers of products — hardware, software and firmware — are encouraged by us to submit their products to THE RAINBOW for certification.

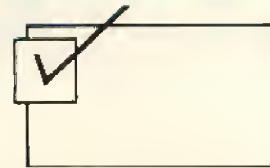
The Seal is not a "guarantee of satisfaction." The certification process is different from the review process. You are encouraged to read our reviews to determine whether the product is right for your needs.

There is absolutely no relationship between advertising in THE RAINBOW and the certification process. Certification is open and available to any product per-

taining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

We will appreciate knowing of instances of violation of Seal use.

## Rainbow Check Plus



The small box accompanying a program listing in THE RAINBOW is a "check sum" system, which is designed to help you type in programs accurately.

*Rainbow Check PLUS* counts the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use *Rainbow Check PLUS*, type in the program and save it for later use, then type in the command RUN and press ENTER. Once the program has run, type NEW and press ENTER to remove it from the area where the program you're typing in will go.

Now, while keying in a listing from THE RAINBOW, whenever you press the down arrow key, your CoCo gives the check sum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK(35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 PDKE Z,Y:NEXT
70 IF W=7985 THEN 80 ELSE PRINT
  "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

# Still pounding away at that keyboard?



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### RAINBOW ON DISK Offers OS-9 Programs

In addition to all the programs offered on tape, part of one side of RAINBOW ON DISK is formatted for the OS-9 operating system. That means you can now get all the OS-9 programs from the magazine — programs that cannot be put on tape. Back issues of RAINBOW ON DISK are available beginning with October 1986. Subscriptions to RAINBOW ON DISK are \$99 a year in the U.S. Canadian rate is U.S. \$115. All other countries, U.S. \$130. Single copy rate is \$12 in the U.S.; U.S. \$14 in Canada; and U.S. \$16 in all other countries.\*

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See: Review - December Rainbow.  
Dale Puckett - November Rainbow.

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|-------------------|---------|
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## GRANITE COMPUTER SYSTEMS

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OS-9 is a trademark of Microware Systems Corporation and Motorola Inc. MS-DOS is a trademark of Microsoft Corp. FLEX is a trademark of TSC, Inc.

MX Dummy variable  
 MY Dummy variable  
 MZ Dummy variable  
 N Number of piece being moved or examined  
 NP Number of players  
 OP Number of opponent's piece  
 P Block where piece to move is currently located

P(X,Y) Array holding x and y coordinates of each block  
 PA(X) Array containing surrounding blocks of any given piece  
 PB(X) Returns a 1 if Direction #x is blocked  
 PJ(X) Array containing jumps possible by any given piece  
 PP(X) Array containing moves possible

```

B145:GOTO54
140 IFX>207ANDX<256THENHCOLOR2:H
PRINT(1,0),"Are you sure you wan
t to quit? (Y/N)"+STRING$(3,32):
EXEC44539:A$=INKEY$:PLAYB$:IFA$=
"Y"ORAS="y"THFNOSIR735:POKE&HFF
D8,0:CLS:RGB:HSCREEN0:POKE41598,
3:POKE41599,3:ENDELSE54
141 IFX>159ANDX<208THENIFJ>0THEN
54ELSEHCOLOR2:HPRINT(1,0),"Save
to (1) disk or (2) cassette?"+"ST
RING$(6,32)
142 EXEC44539:A$=INKEY$:IFA$=CHR
$(12)THEN54ELSEIFA$<>"1"ANDA$<>"
2"THENPLAYE$:GOTO142ELSEPLAYB$:I
FA$="1"THEND=1ELSED=-1
143 X=1:Y=0:GOSUB156:IFGR=1THCNR
ETURNEHPRINT(1,0),"Press any
key to save your game"+STRING$(8
,32):EXEC44539
144 POKE&HFFD8,0:OPEN"O".#D,F$:P
RINT#D,NG(0):NG(1):FORQ=0TO11:P
RINT#D,A(0):B(0):C(0):D(0):NEXT
:PRINT#D,TN:NP:IT:GM:J(0):J(1):
CLOSE#D:POKE&HFFD9,0:GOTO54
145 IFBUTTON(TN*2)=0THEN145ELSEP
LAYB$:RETURN
146 HCOLOR2:IFTN=0THENHPRINT(1,0
),"Red is the winner"+STRING$(22
,32):NG(0)=NG(0)+1:IFNG(0)>999TH
ENNG(0)=0
147 IFTN=1THENHPRINT(1,0),"Black
is the winner"+STRING$(20,32):N
G(1)=NG(1)+1:IFNG(1)>999THENNG(1
)=0
148 POKE&HFFD8,0:FORQ=255TO0STEP
-1:POKE140,Q:EXEC43345:NEXT:PLAY
"L303CG116FF17D0413C03GL16FEL12
D04L3C03GL16FEFL3D02P6DP6L2.CL12
P12CC":POKE&HFFD9,0
149 HPRINT(1,0),"Do you want to
play again? (Y/N)"+STRING$(7,32)
150 EXEC44539:A$=INKEY$:PLAYB$:I
FA$="Y"ORAS="y"THENHSCREEN2:GOTO
12ELSEGOSUB235:POKE&HFFD8,0:CLS:
RGB:HSCREEN0:POKE41598,3:POKE415
99,3:END
151 J=0:HCOLOR2:HPRINT(1,0),"Gre
etings. Your Highness":HDRAW"BM"
+STR$(P(M,0)+16)+"",+STR$(P(M,1
)+12)+"C1L8U6F4E2F2E4D6L8":HPAINT
(P(M,0)+16,P(M,1)+11).1.1
152 POKE&HFFD8,0:PLAY"L1203CEGL6
04CL24CC03L6GL24GGL12EGEL6CP6L12
CEGL604CL24CC03L12ECGL6CP6L1203C
EG04L6C03L12G04L6C":POKE&HFFD9,0
153 RETURN
154 IFOP=A(Q)THENA(Q)--2:BL(OP)=
0:RETURN
155 IFOP=B(Q)THENB(Q)--2:BL(OP)=
0:RETURN
156 HPRINT(X,Y),"What is the fil
ename? "+STRING$(18,32):F$="":F=
0:HPRINT(22+X,Y).CHR$(127)
157 EXEC44539:A$=INKEY$:IFA$=CHR

```

```

$(8)THENF=F-1:IFF<0THENPLAYE$:F=
0:GOTO157ELSEF$=LEFT$(F$,F):HPRI
NT(22+X+F,Y).CHR$(127)+" ":GOTO1
57
158 IFA$=""/"ORAS="".THENPLAYE$:G
OTO157
159 IFA$=CHR$(13)THENHPRINT(22+X
,Y).F$+" ":PLAYB$:RETURN
160 IFASC(A$)<32THENPLAYE$:GOTO1
57
161 F$=F$+A$:F=F+1:IFF=9THENPLAY
E$:F$=LEFT$(F$,8):F=8:GOTO157
162 HPRINT(21+X+F,Y),A$+CHR$(127
):GOTO157
163 IFTN=0THENTH=0:GOTO55ELSEIFN
P=2THEN55ELSEGOSUB89:HPRINT(1,0)
,"Thinking..."+"STRING$(28,32):TH
=1:MP=3584:J=0
164 FORMX=0TO11:IFA(MX)--2THEN17
0ELSEM=A(MX):N=MX
165 GOSUB104
166 FORMY=0TO3:IFPP(MY)--1THEN16
7ELSEIFBL(PP(MY))<>1THENPB(MY)=1
167 NEXTMY
168 FORMW=0TO3:IFPB(MW)=1THEN169
ELSEXX=MW:PR=0:GOSUB224:POKEMP,M
X:POKEMP+1,PP(MW):POKEMP+2,PJ(MW
):GOSUB197:POKEMP+3,PR:MP=MP+4
169 NEXTMW
170 NEXTMX
171 IFMP=3584THEN179ELSEXW=PEEK(
3584):XX=PEEK(3585):XY=PEEK(3586
):XZ=PEEK(3587):FORMX=3584TO MP-
1STEP4
172 PC=PEEK(MX):PP=PEEK(MX+1):PJ
=PEEK(MX+2):PR=PEEK(MX+3)
173 IFPR=XZ THENXW=PC:XX=PP:XY=P
J:XZ=PR
174 IFPR=XZ THENIFRND(10)<RND(10)
)THENXW=PC:XX=PP:XY=PJ:XZ=PR
175 NEXTMX
176 P=A(X):M=XY:N=XW:FORMZ=0TO1
1:IFB(MZ)=XX THEN177ELSENEXT
177 X=B(MZ):B(MZ)--2:BL(X)=0:MZ=
11:TH=2:J=1:GOTO103
178 FORMZ=0TO3:IFPB(MZ)=0 ANDPJ(
MZ)>-1 THENXY=PJ(MZ):XX=PP(MZ):G
OTO176ELSENEXT
179 BK=6656:POKEBK,255:MX=0
180 IFA(MX)--2THEN188ELSEM=A(MX)
:N=MX
181 GOSUB104:GOSUB228
182 IFIT=1THEN186ELSEIFPA(1)>-1
ANDPA(2)>-1 THENIFBL(PA(2))=0 AN
D BL(PA(1))=1 THENFORQ=0TO11:IFD
(Q)=2ANDB(Q)=PA(1)THENPOKEBK,PA(
2):BK=BK+1ELSENEXTQ
183 Q=12:IFPA(0)>-1 ANDPA(3)>-1
THENIFBL(PA(3))=0 ANDBL(PA(0))=1
THENFORQ=0TO11:IFD(Q)=2ANDB(Q)=
PA(0)THENPOKEBK,PA(3):BK=BK+1EL
SENEXTQ
184 Q=12:IFPA(1)>-1 ANDPA(2)>-1
THENIFBL(PA(1))=0 AND BL(PA(2))=
1 THENPOKEBK,PA(1):BK=BK+1

```

PR by any given piece  
 Priority of a move  
 Q Dummy variable  
 QX Dummy variable  
 R Dummy variable  
 TH Returns 1 or 2 if computer is "thinking"  
 TN Returns 0 on Red's turn, 1 on Black's turn

W Dummy variable  
 X Dummy variable  
 XW Dummy variable  
 Y Dummy variable  
 (Questions or comments concerning this article may be addressed to the author at 266 Riverview Drive, Ephrata, PA 17522. Please include an SASE when requesting a reply.)

```

185 IFPA(0)>-1 AND PA(3)>-1 THEN
IFBL(PA(0))=0 AND BL(PA(3))=1 TH
ENPOKEBK,PA(0):8K=BK+1
186 FORMW=0T03:IFPP(MW)--1THEN18
7ELSEIFBL(PP(MW))>0THEN187ELSEPO
KEMP,MX:POKEMP+1,PP(MW):PR=4:GOS
UB204:POKEMP+2,PR:MP=MP+3
187 NEXTMW
188 MX=MX+1:IFMX<12THEN180
189 IFIT<3THEN191ELSEFORML=3585T
0 MP-1STEP3:FORQW=6656TO BK-1:IF
PEEK(ML)=PEEK(OW)THENPOKEML+1,PE
EK(ML+1)+1
190 NEXTQW,ML
191 IFMP=3584THEN137ELSEXW=PEEK(
3584):XX=PEEK(3585):XY=PEEK(3586
):FORMX=3584TO MP-1STEP3
192 PC=PEEK(MX):PP=PEEK(MX+1):PR
=PEEK(MX+2)
193 IFPR>XY THENXW=PC:XX=PP:XY=P
R
194 IFPR=XY THENIFRND(10)>RND(10
)THENXW=PC:XX=PP:XY=PR
195 NEXTMX
196 P=A(XW):M=XX:N=XW:GOTO77
197 M=PJ(XX):N=MX:GOSUB104
198 FORMY=0T03:IFPP(MY)--1THEN19
9ELSEIFBL(PP(MY))<>1THENPB(MY)-1
199 NEXTMY
200 FORMY=0T03:IFPB(MY)=0THEN201
ELSE203
201 IF(N)=2THENBL(PP(MY))=10
202 XX=MY:PR=PR+1:GOTO197
203 NEXTMY:RETURN
204 IFIT=1THEN208ELSEM=A(MX):P=M
:GOSUB228:IFPA(1)>-1 ANDPA(2)>-1
THENIFBL(PA(2))=0 AND BL(PA(1))
-1 THENFORQ=0T011:IFD(Q)=2ANDB(Q
)=PA(1)THENPR=PR+1ELSENEXTQ
205 Q=12:IFPA(0)>-1 ANDPA(3)>-1
THENIFBL(PA(3))=0 ANDBL(PA(0))=1
THENFORQ=0T011:IFD(Q)=2ANDB(Q)=
PA(0)THENPR=PR+1ELSENEXTQ
206 Q=12:IFPA(1)>-1 ANDPA(2)>-1
THENIFBL(PA(1))=0 AND BL(PA(2))=
1 THENPR=PR+1
207 IFPA(0)>-1 AND PA(3)>-1 THEN
IFBL(PA(0))=0 AND BL(PA(3))=1 TH
ENPR=PR+1
208 IFPP(MW)>27ANDPP(MW)<32ANDC(
N)<>2 THENPR=PR+1
209 M=PP(MW):P=M:GOSUB228
210 IFPA(1)>-1 ANDPA(2)>-1 THENI
FBL(PA(2))=2 ANDA(MX)=PA(2)AND B
L(PA(1))=1 THENFORQ=0T011:IFD(Q)
=2ANDB(Q)=PA(2)THENPR=PR-1ELSENE
XTQ
211 Q=12:IFPA(1)>-1 ANDPA(2)>-1
THENIFBL(PA(2))=0 ANDBL(PA(1))=1
THENFORQ=0T011:IFD(Q)=2ANDB(Q)=
PA(2)THENPR=PR-1ELSENEXTQ
212 Q=12:IFPA(0)>-1 ANDPA(3)>-1
THENIFBL(PA(3))=2 ANDA(MX)=PA(3)
ANDBL(PA(0))=1 THENFORQ=0T011:IF
D(Q)=2ANDB(Q)=PA(3)THENPR=PR-1EL

```

```

SENEXTQ
213 Q=12:IFPA(0)>-1 ANDPA(3)>-1
THENIFBL(PA(3))=0 ANDBL(PA(0))=1
THENFORQ=0T011:IFD(Q)=2ANDB(Q)=
PA(3)THENPR=PR-1ELSENEXTQ
214 Q=12:IFPA(1)>-1 ANDPA(2)>-1
THENIFBL(PA(1))=2 ANDA(MX)=PA(1)
AND BL(PA(2))=1 THENPR=PR-1
215 IFPA(1)>-1 ANDPA(2)>-1 THENI
FBL(PA(1))=0 ANDBL(PA(2))=1 THEN
PR=PR-1
216 IFPA(0)>-1 AND PA(3)>-1 THEN
IFBL(PA(0))=2 AND A(MX)=PA(0)AND
BL(PA(3))=1 THENPR=PR-1
217 IFPA(0)>-1 ANDPA(3)>-1 THENI
FBL(PA(0))=0 AND BL(PA(3))=1 THE
NPR=PR-1
218 RETURN
219 FORMY=0T03:IFPP(MY)--1THEN22
0ELSEIFBL(PP(MY))<>1THENPB(MY)-1
220 NEXTMY
221 GOTO178
222 FORQ=18T022:HPRINT(0,Q),STRI
NG$(40,32):NEXTQ:RETURN
223 RETURN
224 IFC(N)=2THENBL(PP(MW))-10:PR
=PR+1
225 RETURN
226 EXEC44539:A$=INKEY$:IFA$=CHR
$(12)THENGOSUB222:GOTO12ELSERETU
RN
227 POKE&HFFD9,0:PLAYE$:HPRINT(E
X,EY),"E R R O R Press any ke
y to continue ":EXEC44539:HPRIN
T(EX,EY),STRING$(40,32):IFEY=0TH
ENX=160:GOTO141ELSE156
228 FORQ=0T03:PA(Q)--10:NEXT:IF(
PAND4)=4THENPA(0)-P-4:IF((P-5)AN
D4)=((P-4)AND4)THENPA(1)-P-5
229 IF(P AND4)=0 THENPA(1)-P-4:I
FINT((P-3)/4)<>(P-3)/4THENPA(0)=
P-3
230 IF(M AND4)=4 THENPA(2)-M+4:I
F((M+3)AND4)=((M+4)AND4)THENPA(3
)-M+3
231 IF(M AND4)=0 THENPA(3)-M+4:I
FINT((M+5)/4)<>(M+5)/4THENPA(2)=
M+5
232 FORQ=0T03:IFPA(Q)<0ORPA(Q)>3
1THENPA(Q)--1
233 NEXTQ
234 RETURN
235 GR=1:HPRINT(1,0),"Do you wan
t to save the score? (Y/N)"*STRI
NG$(3,32):EXEC44539:A$=INKEY$:PL
AYB$:IFA$<"Y"ANDA$<"y"THEN237
236 X=160:GOSUB141:GR=0:HPRINT(1
,0),"Press any key to save the s
core":EXEC44539:POKE&HFFD8,0:OPE
N"O",#D,F$:PRINT#D,NG(0):NG(1)::
CLOSE#D:POKE&HFFD9,0
237 HCLS8:HCOLOR0:PALETTE0,18:FO
RQ=191T00STEP-1:HLINE(289,Q)-(30
,Q),PSET:NEXT:RETURN

```

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```

BP 10 40 40 09 10/89 50 00 00 5
=====
= Message Section 1 =
=====
<0> Star Trek Forum
<1> Political Forum
<2> Ham Radio Forum
<3> Discussion Forum
<4> Role Playing Forum
<5> Movie Review Forum
<6> BBS Information Forum
<7> Classified Ad's Forum
<8> Science Fiction Forum
<9> Continuous Story Forum

<!> Music Forum
<=#> Sysops Forum
<v#> General Forum
<v#> Literary Forum
<v#> Religion Forum

```

## Software

CoCo 3

# CEBBS— A BBS You Can Live With

Bulletin board systems (BBSs) have increased in popularity dramatically over the years. As more and more people acquire home computers, the number of those owners who decide to set up a BBS has also risen. In order to run a good board, you need a quality BBS program. One of the newest additions to the CoCo BBS market is *CEBBS*, a software package I believe to be easy enough for the average computerist to use and powerful enough to satisfy the SysOp (System Operator, the person who runs the board). Running a BBS is an adventure that usually requires close contact and interaction with the board, almost

like having a roommate; *CEBBS* is a BBS you can live with.

*CEBBS* requires a CoCo 3, an RS-232 pack and a Multi-Pak (or a Y-cable). You also need an auto-answer modem with a DTR lead, which stands for Data Terminal Ready. This is used by the BBS to quickly disconnect users. At least one disk drive is also necessary, but the more the better. If you have 512K in your CoCo 3, you can significantly increase the speed of the BBS by using a RAM disk program. However, the software allows use of only drives 0 through 3, so RAM disk programs that expand drive numbers to the range of 0 to 5

don't work fully with this BBS. The author is presently working on a modification to make those RAM disks work with *CEBBS*. If you have Disk BASIC 1.0 or are using a DOS that has been modified to overlap the GAT (Granule Allocation Table) to allow more than 35 tracks (such as *ADOS*), you can also experience problems when using the message base. This can easily be avoided by putting all message-related files (*MESSAGES.SYS*, *HEADERS.SYS* and *INDEX.SYS*) on one drive.

*CEBBS* comes with an extensive 43-page manual, which I found to contain a few typographical errors but no technical ones. The use of the BBS and the functions available are documented in great detail, and there are only a few sections that could have benefited from a little expansion. A commented source code listing of the machine language driver would have been useful but is not necessarily customary for this type of package and is not needed for proper use of the board.

*CEBBS* operates with a bread-board-type scheme, a method of allowing the SysOp flexibility in the design and operation of the board, primarily through the use of menus. Those of you who have used the *COBBS* program (published in the November 1985 *RAINBOW*) will find *CEBBS* in some ways similar.

There are several different programs used by *CEBBS*. Six of them are actually used while the BBS is running. The first is *MAIN.SYS*, which contains the main body of the BBS and handles most of the functions. *MESSAGE.SYS*, loaded when the message base is accessed, handles the various message functions. *UPLOAD.SYS* contains the BASIC code and ML driver for the checksum Xmodem upload, and *DOWNLOAD.SYS* is its counterpart. *LOGON.SYS*, which controls a user's initial logon, is the program that resides in the CoCo's memory while the BBS is waiting for a caller. It also contains the routines that obtain the necessary information from new users. *LOGOFF.SYS* is a short program responsible for correctly logging users off the system.

Four of the programs on the disk are used when *CEBBS* is booted up. *BOOT.BAS* is the program that is run to start the system. It loads and executes *CLOCK.BIN* (the software clock), *DRIVER.BIN* (the ML driver) and *OPTIONS.BIN* (sets up the USR routines).

The remaining seven programs are editors used by the SysOp to update and maintain various data used by the BBS. *MESSAGE.EDI* allows modification and purging of the message base. *USERLOG.EDI* performs the same features for the userlog. *QUOTES.EDI* is used to add and delete "Quotes of the Day," which are displayed to users at logon. This Quote of the Day feature adds a nice touch to the board and is popular with users. The program *DESCRIPT.EDI* is used for the download descriptions. If you have chosen to have the system tracer data sent to the disk, you can use *TRACER.EDI* to either view the information on the screen or send it to the printer. The tracer records who logged on and what functions they accessed while online, as well as any errors that occur.

*TEXT.EDI* is a mini text editor used in place of a word processor for text file and menu creation (discussed later). The final program, *CONFIG.EDI*, is used to configure *CEBBS* to match your particular computer system as well as your personal tastes. Various features of the BBS can be altered with it, and the program also obtains information from the SysOp concerning which disk drives contain which programs. Be-

fore starting up the board, you must determine which drives hold the various programs needed to operate the BBS. The programs must remain in the appropriate locations and cannot be moved unless *CONFIG.EDI* is run again.

All the editors operate well and are simple to use, making the SysOp's job a little easier—good support utilities are the part of a BBS that the SysOp appreciates greatly and becomes very familiar with. I did find one error, and that was in the configuration program (*CONFIG.EDI*) at Line 330. The 410 at the end of the line should be 360 instead. This corrects an error that causes those choosing to have tracer data sent to the printer to miss 11 configuration options.

The programming in all areas of the BBS is very crisp and clear. The BASIC programs are not *extremely* well documented but contain sufficient remarks that, combined with the straightforward code, make reading them a snap. This should make it easy for those who want to modify the system (a desire that seems very common among SysOps). The BASIC code is surprisingly easy to read considering that it is BBS software. The normal preponderance of peeks and pokes is absent due to the excellent use of USR function calls to communicate with the ML routines. And the ML code is also well-written and not too difficult to follow, even without comments. Much of the speed and clean quality of this BBS is due to the author's no-nonsense programming.

### The Driver

The machine-language driver program for *CEBBS* is a very fast, effective driver that adds much to the power of this BBS. It contains crisp ML programming with some impressive code, and I find no errors in it. The author's use of USR commands to allow BASIC to access various driver functions is well done and makes using it easy and straightforward.

This driver operates similarly to others that hook into *CONSOLE OUT* to send output to both the screen and the modem. However, instead of hooking into *CONSOLE IN*, it modifies BASIC's *KEYIN* routine to jump to the new code, which then returns to the *KEYIN* routine. This allows both the *INPUT* and *INKEY\$* commands to work perfectly for receiving data from the modem.

The driver supports features commonly found in such drivers. It can be set to output a specific character, such as an asterisk (\*) in place of the regular output; this is nor-

## Computing on Cocoa Beach

Kevin Berner lives and programs in beautiful Cocoa Beach, Florida. He founded KB Enterprises in January of this year to serve as an outlet for his many excellent programs; most of the sales are through dealers or mail order, and the company is off to an excellent start.

A member of the CoCo community for many years, Kevin began with the old gray-case 16K CoCo (with standard BASIC) and has remained with the CoCo ever since. He has been programming for just as long, and the code contained in *CEBBS* is indicative of a great deal of programming experience and knowledge. He currently has a BBS running with his *CEBBS* software and is also a routine user of the many other BBSs in the Cocoa Beach area.

He has produced several programs that work with Burke & Burke's *Hyper-I/O*, including the *Hard Drive Utilities* package, *Disk Doctor*, *Hard Drive Zap* and *Autopark*, which automatically parks the hard drive head after a period of inactivity. *CEBBS* is designed to be compatible with *Hyper-I/O* and is structured to make full use of the storage a hard drive makes available. *CEBBS* is the result of an extensive three-year project that incorporated much of Kevin's programming knowledge and experience with BBSs. Its precise manual is a result of his good communication abilities.

Kevin has just completed *Basic Windows*, a program that allows a 512K CoCo 3 to have six separate complete windows of BASIC running independently. And he is continually working to improve *CEBBS*.

Not yet out of college, this excellent programmer has much yet to contribute to the CoCo Community in the future.

## Anatomy of a BBS

The BBS is an exciting aspect of computer technology that has found an important place in today's society. We are said by some to be in the "Information Age," and the BBS is a perfect example of the flow of information that characterizes communication in this fast-paced world. National bulletin boards such as Delphi serve as integral parts of the computer industry in all its aspects. Local boards are also becoming important bases for the exchange of information and data and as think tanks for programmers and developers. The private BBS is an interesting combination of hardware and software that results in a powerful computing tool.

*CEBBS* operates in a fashion common to most of the CoCo BBSs. The bulk of the code is in BASIC, with machine-language drivers to tie the input and output to the modem. This scheme is popular due to several factors. The ML code provides the speed necessary to send data at the rate of 300 bytes *per second* when running at 2400 baud. (For you typists, that is about 3600 words per minute!) BASIC makes it easy for the SysOp to customize the board as desired and is also a good language for programming the type of input, output and processing a BBS uses.

The hardware starts with the computer itself. The CoCo makes an excellent host computer, except for the lack of a built-in real-time clock; keeping the

correct time is often important for a BBS. Software clocks keep fair time, but many SysOps choose to use one of the real-time clocks available for the CoCo.

Data storage is a major factor when dealing with a BBS, especially one that offers upload and download capabilities. I have used (and run) excellent BBSs based solely on a few floppy drives, but hard drives are a popular addition now due to their low cost. CoCo 3 boards often use a RAM disk to provide lightning fast access to most-used programs; they can make all the difference between a board that appears quick and smooth and one that appears slow and choppy.

An auto-answer modem is also needed, and many users expect at least 1200 baud for a serious board. The final consideration is the means used to connect the modem to the computer. The serial port has been popular for a low-cost board, but speed considerations have demanded an RS-232 pack for faster and smoother data transfer; use of a pack will require a Multi-Pak (more reliable than a Y cable).

Many CoCo users who desire to start BBSs already have the hardware requirements taken care of and simply need good software to get them going. *CEBBS* is one key that opens the door to your own BBS.

ally used to mask the user's password as it is being typed in. The driver can be set to either send or not send linefeeds with each carriage return; this is used for some users whose computers normally expect the linefeed. You can tell it to accept both upper- and lowercase as input or to convert all input to uppercase. You *cannot* choose to have all input converted to lowercase. Output can be sent as both upper- and lowercase or as just uppercase. Output to and input from the current online user can also be turned off, useful for when the SysOp is performing local functions that should not be viewed by the user.

The driver also works with the software clock (which keeps adequate but not perfect time because of interrupt masking) to provide several additional features to the BBS. The user's time allowed and time used is constantly compared, and the user is disconnected as soon as that limit is reached.

After eight minutes of no activity from the user, disconnection also occurs.

In addition to the normal error trapping, the system can be set to lock up if it breaks into BASIC's direct mode, thus keeping users from gaining access to your system files. The SysOp can turn this protection on or off from the host computer at any time.

One minor problem, which is also found in other drivers designed to be used with the RS-232 pack, is that no output can be sent to the modem unless a carrier is detected. Normally this check for a carrier is desired, but I like to be able to send commands to my modem (such as to turn the speaker off so the annoying carrier signal isn't broadcast all over the house) from within the program while no user is online.

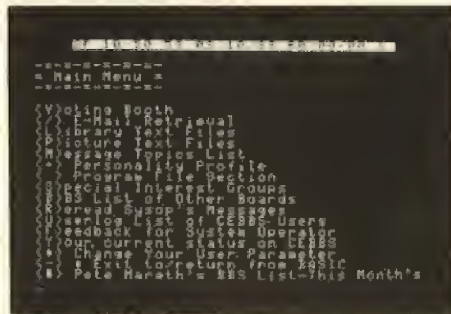
I liked the driver for this BBS and think that the features it has, along with its excellent integration with BASIC, give *CEBBS* much of its power.

## The Menus

The popularity of the bread-board type system is due primarily to the board's configuration being completely in the SysOp's hands. The menus with which the users are prompted and the commands available at each menu are determined by the SysOp and can easily be changed. The procedure used to create menus with this board are similar to those used with *COBBS*, except that *COBBS* uses a special editor to work with the menus. *CEBBS* simply uses menus in the form of text files created with a word processor (a mini text editor is included with the BBS in case a word processor isn't available to you). This makes menu creation easier and also makes changes simpler. Also with *CEBBS*, you can have as many menus as you have disk space for.

Menus are created by adding *command lines* that contain the text shown to the user and the command the system executes if the user chooses that option. For example, a command line such as <C>hat with SysOp\ (C) (A) (C) prints the text before the \ to the user. The first letter in parentheses is the key the user must press to activate the command, in this case a C. The next letter, an A, is a *privilege character* that must be contained in the user's userlog file in order for that user to be able to access this command. This is different from the privilege system used in *COBBS*, which involves flags and a privilege level. And the final C is the function activated by this command, in this case a call to the Page SysOp routine.

There are several other functions that can be accessed by the menus, such as a call to the message base, which allows the user access to the specified *forum* (message section) for reading and posting messages. This function is explained in greater detail below. Other functions allow the user to print a specified text file, go to a different



```
-----
Main Menu =
-----
V) Mail Retrieval
V) Library Text Files
V) Message Topics List
V) Personal Profile
V) Message File Section
V) Special Interest Groups
V) List of Other Boards
V) Send SysOp's Message
V) Userlog List of CEBBS Users
V) Feedback for System Operator
V) Your current status on CEBBS
V) Change Your User Parameters
V) Exit to Return from BASIC
V) Pete Harath's BBS List-This Month's
```

menu, run an external program, upload a file, download a file, view descriptions of available downloads, view time and date, show status of the current user, list users of the system, change user parameters (such as password, upper/lowercase, etc.), exit into BASIC (allows remote operation by the SysOp), and log off the system. The BBS comes with three sample menus so you can



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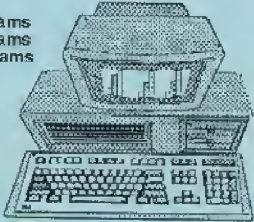

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- GR2 - 12 Basic Graphic Programs
- GR3 - 9 Coco 3 Graphic Programs
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- GR5 - 22 Coco Max Pictures
- GR6 - 22 Coco Max Pictures
- GR7 - 15 Coco Max Pictures
- GR8 - 22 .Bin Pictures
- GR9 - 22 .Bin Pictures
- GR10 - 14 Large .Bin Pictures
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- GR13 - Macpaint Graphic Editor
- GR14 - 5 Macintosh Pictures




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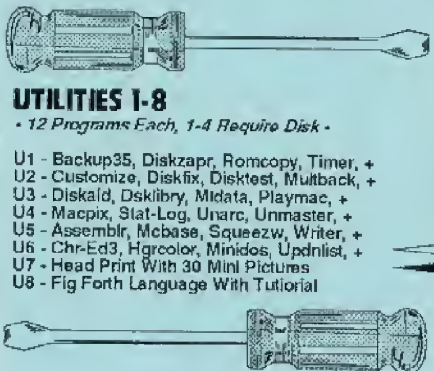
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**CIRCLE ISSUES DESIRED**

|    |      |    |    |      |
|----|------|----|----|------|
| M1 | GR1  | E1 | U1 | GA1  |
| M2 | GR2  | E2 | U2 | GA2  |
| M3 | GR3  | E3 | U3 | GA3  |
| M4 | GR4  | E4 | U4 | GA4  |
| M5 | GR5  |    | U5 | GA5  |
| M6 | GR6  | H1 | U6 | GA6  |
| M7 | GR7  | H2 | U7 | GA7  |
| A1 | GR8  | H3 | U8 | GA8  |
| A2 | GR9  | H4 |    | GA9  |
|    | GR10 |    |    | GA10 |
|    | GR11 |    |    | GA11 |
| T1 | GR12 |    |    |      |
| T2 | GR13 |    |    |      |
| T3 | GR14 |    |    |      |

PLEASE CIRCLE  
**TAPE                  DISK**

see how they should be prepared. Note: The sample Logoff menu contains an error that must be fixed in order for the "quick disconnect" function to work properly.

The menu system used by *CEBBS* is easy to operate, and it provides the flexibility available to boards of this type. The actual processing of the menus and output to the user is quick, thanks to the efficient coding found in the program, and this added to the overall smoothness of the board's operation.

### The Message Base

In general the message base is the most used and most important part of any BBS, often making or breaking a board. All the *CEBBS* message functions work as intended, and its design enables the SysOp to set up an extensive message section. The commands needed to access the message base have been streamlined and made simple to use. A menu command such as <G>enera1 Messages\ (G)(A)(M)GENERAL loads the message base program and uses GENERAL as the forum name to search for in the messages. All message functions are handled within the program itself so that it is no longer necessary to have separate menu commands for reading, scanning, posting, etc. The only problem with this setup is that some flexibility is lost. It is not possible to give a user READ access to a message forum without allowing that user to also POST. In addition to a separate forum designed for private E-mail only, all of the forums can have private messages saved on them. While some SysOps want this feature, others might want a single E-mail forum but need to modify the program to implement this.

A few nice features have been added to the *CEBBS* message section. One appreciated addition is a string-replacement line-editing feature, found on most boards, that allows replacement of individual words or letters within a line without re-typing the entire line. The author is also on the right track with the message indexing he uses. While it is not as fast or complex as some true indexing schemes, it does allow quicker searches through the messages. This is very helpful considering that at logon every single message is scanned, and the same is done for individual messages until the desired one is found.

The message section seemed not to flow as well as the rest of the board and is lacking in some features that would have been helpful. However, it functioned perfectly and is both stable and reliable.

### Conclusion

I used *CEBBS* for almost a month in place of my normal board in order to be able to fully test it in the intended environment; in that time not a single error occurred. As

a SysOp I find the BBS easy to install and maintain. As a programmer I appreciate the nice coding in both BASIC and machine language. As a BBS user I find *CEBBS* to be lacking a few features found on some other boards, but it is the best BBS I have seen for the CoCo.

If you are looking for a board that comes ready-to-run on a CoCo 3, is easy to install and use, is powerful and can make full use of a hard drive, has checksum Xmodem up- and downloading and crisp and concise code, *CEBBS* is for you. (I want to thank those who were helpful in the review process for *CEBBS*: Duane Banks, Charles Curran, Todd Miller, Tim Johnsrude, Jeff Lemieux, Brad Hampton, Darrell Stewart, and all the other users who participated. Thanks!)

*CEBBS* is available through Microcom Software, or directly from KB Enterprises.

(KB Enterprises, 435 Brightwaters Drive, Cocoa Beach, FL 32931, 407-799-3253; \$49.95 introductory)

—Michael G. Toepke

## Software

CoCo 1, 2 & 3

### Art-Deli II— A Second Helping of Ready-Made Graphics

*Art-Deli II* is a follow-up to *Art-Deli*, a 440-picture clip-art library reviewed in October 1987's issue of *THE RAINBOW*. *Art-Deli II*'s pictures are PMODE4 black-and-white scanned images that can be loaded into a graphics editor (I loaded them into *CoCo Max III*) or a desktop publisher (*Max-10*), or dumped to the printer using a screen dump program. Each disk includes a viewing utility that allows the pictures to be viewed once or continuously.

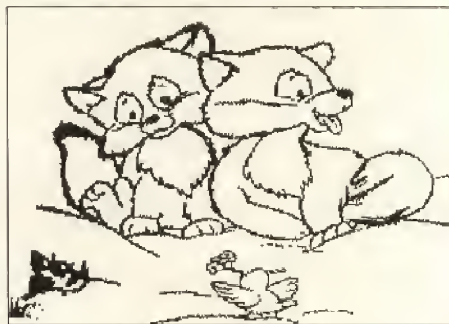
*Art-Deli II* consists of five double-sided disks (packed in a 10-disk holder) containing the following categories of pictures: Kid Sports, Baby Animals, Birds, Ducks, Animated Favorites I and II, Cars, Boats, Shapes and Road Signs. The disks are "flippies" so they work fine with single-sided drives. The package includes a small (4½-by-5½-inch) catalog, so you can look for a picture to fit your needs without having to load and page through the disks. The complete set is \$49.95, but single disks can be purchased for \$9.95 each plus \$3 shipping and handling.

Each disk side covers one category, and each category contains 22 picture files with .ART extensions, a BOOT.BAS file and a SYSTEM.BIN file. BOOT.BAS loads SYSTEM.BIN, which brings up the viewing utility. It asks if you want to page continually through the pictures or view them only

**E**ach picture is actually a *CoCo Max II* compatible picture. To load an image into *CoCo Max III*, change the .ART extension to .MAX, then load it through *CoCo Max III*'s TRANSLAT program

once. The utility puts each picture onscreen for a few seconds then automatically displays the next screen. I found that after going through one disk you can insert a second disk and see its pictures without having to reload the utility.

*Art-Deli II*'s pictures can be put to many uses. They can enhance newsletters, bulletins, cards, posters, etc. There are many applications for school use, for both fun



and serious study. Children can make posters and signs featuring Mickey Mouse, the Pink Panther, Garfield the Cat and more. If your class project is writing about the evolution of water travel, the Boat category might come in handy; it shows representative vessels from Indian dugouts to viking ships to pirate ships to modern battleships and luxury liners.

Each picture is actually a *CoCo Max II* compatible picture. To load an image into *CoCo Max III*, change the .ART extension

to .MAX, then load it through *CoCo Max III's* TRANSLAT program. (I had to call Specialty Projects to find out how to do this; it would have been nice if the instructions were included in my review copy.) I have a suggestion for Specialty Projects: How about incorporating a utility that backs up each disk and renames the files for the most popular graphics editors? This would eliminate the tedious renaming process. Also, for those who are not familiar with disk commands or do not want to become overly computer literate, it would allow quick and friendly access to the program. In my job as a microcomputer support person, I have often had to walk my customers through simple procedures simply because they refuse to learn the specifics of their operating system.

You can manipulate the picture within *CoCo Max III* but, as the earlier review mentioned, coloring the pictures with the Paint function is difficult. These pictures were meant to serve as clip art for newspapers and newsletters, where color is rarely involved. I used *Max-10's* picture translator, also, to import *Art-Deli II* pictures, once again changing the .ART extension to .MAX. This type of setup is where *Art-Deli* is most useful — as clip art for your desktop publishing applications.

I recommend *Art-Deli II* to anyone needing clip art for desktop publishing, printing cards and bulletins, etc. It is easy to use and needs very little documentation.

(Specialty Projects, 4810 McCrory, Memphis, TN 38122, 901-682-8737; \$9.95 per disk; \$49.95 for the set plus \$3 S/H.)

—Kay Cornwell

## Software

CoCo 3

### **BASIC Windows— Multitasking in 512K Without OS-9**

So you just plopped down your hard-earned cash and got that 512K upgrade for your beloved CoCo. You found the price a little unsettling, to say the least. You're undecided on the OS-9 question, and at the price advertised (\$71.95) it just doesn't seem to be the answer to your dreams. Besides, you're not really sure you could justify that kind of negative cash flow to your better half.

How about finishing that BASIC program you've been working on, while referring to the flowchart you wrote for it, and enjoying a continuing game of solitaire all at the same time. Imagine being able to accomplish all that without the long, lonely nights and colorful language often associated with OS-9 — and without thinning your checking account.

K.B. Enterprises has developed an economical utility called, of all things, *BASIC Windows*. This fast-loading little gem gives the CoCo 3 six windows under Disk BASIC. Each window is clearly labeled with its number so users can tell which window they are currently in.

Unlike OS-9 the whole loading process takes less than 5 seconds, and there are no volumes of commands to memorize. To use the system you must remember only that the F1 key is the window-shifting key and Window 1 is the only one that supports the high-resolution commands of BASIC. These commands are basically — no pun intended — the H commands. All other commands are available on all windows.

I was able to run *Disk EDTASM* in Window 3, the *CoCo Flow* program (March '86 RAINBOW) in Window 2, and *Solitaire 3* (December '88 RAINBOW) in Window 1. Remember, Window 1 is the only high-

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resolution window. All these programs were running at the same time and without any apparent effect on each other. It was not unlike having six different CoCos in the same box. Each window reports a total of 22,820 bytes of memory available on startup, regardless of the number of windows running programs.

The program is not copy-protected, thank goodness, and it takes up only one granule of disk space. This allows for the incorporation of the utility to any disk containing programs you might want to use. For example, you can run the finance program by Dale Tinklepaugh (April '88 RAINBOW) in the third window and the modified spreadsheet program by Saul Mooallem (March '88 RAINBOW) in Window 6, along with the inventory program by Bill Tottingham (April '88 RAINBOW) in Window 4. All this at the same time without the OS-9 beast rearing its head! You can even play *Les Lutins* by Louis Parson (June '87 RAINBOW) in Window 1 whenever the mood strikes.

It doesn't take much to recognize the potential of this program, and at \$34.95 it seems a reasonably good deal. There are, however, a few things you might want to consider before deciding to purchase it.

The first is its relative low cost when

compared to OS-9 and *Window Master*. This low cost includes a greater degree of difficulty in learning as well as financial outlay. Another thing to consider is the availability of inexpensive software (RAINBOW ON DISK) that can be used under this utility as opposed to the requirement to purchase OS-9-based software for whatever task you're looking to perform.

The program could use the additional ability of shifting back to the previous window, something in the way of the SHIFT-CLEAR key under OS-9. If you're working in Window 3 and want to go back to Window 2, you must pass through windows 4 through 1 before you can get to Window 2. Also, any program running in any window runs *very slowly* so your score in *F15 Eagle* (August '87 RAINBOW) should improve greatly.

Yet another consideration is that each window supports only a relatively small BASIC or machine language program due to the available memory of 22,820 bytes in each window.

If you use a printer, you will find it is controlled by only one window at a time via the F2 key. The window you are in when you press the F2 key is the controlling window for the printer. The pokes for printer speed control are fully supported, as is the

DRIVE command of BASIC. CoCo 3 systems with two disk drives can change the default drive of any window to any drive, allowing the use of two disks at the same time.

The documentation consists of three typewritten pages with a cover sheet. The instructions for loading and operating are very clear and informative. There is even a handy table describing the BASIC commands available to each window.

The program requires a 512K CoCo3 to run, and if you're looking for an easy-to-operate, cost-effective alternative to some of the other windowing environments,

*BASIC Windows* may just be the answer to your needs.

On the other hand, you should keep in mind that, unlike the 8088 IBM XT machines (*yuk!*), software is still being developed for the CoCo. In order to take full advantage of our *incredible* machine, you should give serious consideration to taking that big step into the world of OS-9.

(K.B. Enterprises, 435 Brightwaters Drive, Cocoa Beach, FL 32931, 407-799-3253; \$34.95 plus \$1.50 S/H)

—Terry Parks

## Software

CoCo 1, 2 & 3

### Danosoft's Disk Utilities— Must-Have Software for the Disk User

In the past few years some remarkable software and hardware for the CoCo has been coming out of Canada. Everyone should be familiar with CRC Computers in Quebec and their Disto products created by Tony DiStefano. Oblique Triad and Magus Systems are familiar names, and there are several others who advertise in *THE RAINBOW* from time to time. In the past few months, a new name has made its debut from our neighbors to the north, namely Danosoft, of Mississauga, Ontario. I reviewed Danosoft's *Big Basic* memory utility for *THE RAINBOW* (October '89), and now I bow to Danosoft's superior work again. This month let's take a look at Danosoft's *Disk Utilities* package, a great product at a moderate price.

There are plenty of alternate disk operating systems out there to let you use double-sided disk drives with the CoCo, and quite a few that allow the CoCo to access all 40 tracks on a side. This being the case, why buy a utility to do the same thing? That's easy: compatibility and price.

Danosoft's *Disk Utilities* consist of a half-dozen of the utilities you've always wanted at a price (\$17.95 U.S.) far lower than the competition's, less than \$3 per program. At that price, how much of a bargain can they be? Read on! A single disk contains all six utilities, and they are quite efficient, none using more than one granule; most of them don't even consume any user RAM. Bigger isn't always better, especially when you're trying to wring the last sector out of every disk.

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At the top of my personal wish list lately has been a program that would access both sides of a disk on a full 40-track 360K drive, like the big boys do it. I found it with *Big Disk*. Once loaded, *Big Disk* allows you to DSKINI a blank floppy on both sides at once, giving you a continuous 80 tracks — using both sides of the disk — instead of two independent 40-track sides. Say you're writing that Great American (or Great Canadian) Novel and you're tired of telling the word processor which side of which disk the next chapter goes on. Or you're making up that great disk of short BASIC programs you've always wanted, and Drive 0 with Drive 2 is a bit awkward when you've only got one drive with 250K or so of programs on it. *Big Disk* formats and reads both sides of any double-sided drive with 158 granules and 360K of storage space. It also maintains compatibility with your 35-track disks, reading them normally, with 68 sectors. But is it compatible with other software? My "fussy" word processor thinks so! It says that this disk has 27 granules used up on it, with 131 granules to go. Playing around with the surliest, most stubborn software I can find, everything works just fine. Case closed.

Some people like to have their disks' sides separated. The president of my CoCo club decided long ago he wanted Drive 0 and Drive 2 together and Drive 1 and Drive 3 on the same floppy. He might prefer DOUBLE40. This utility initializes each side of each floppy with 40 tracks, using the arrangement mentioned above. Even so, it too maintains compatibility with the "little" 35-track disks and reads commercial software packages normally. It only uses the double-40 format with disks initialized while it's installed.

Well enough, I suppose, but what do I do with a six-year collection of 35-track disks? Hmmm. Here's CONVERT/DSK. What does it do? Danosoft says I can LOADM CONVERT/DSK, then put in my favorite old disk and DSKINI it. What, and erase my disk? No, trust me, friends: CONVERT/DSK gently adds five new tracks to the regular 35, then formats the flip side with 40 more. It also works to set up disks to function under either *Big Disk* or DOUBLE40, using a modified DSKINI function. Danosoft does recommend that you cold start your computer before and after using CONVERT/DSK, however, because it does some strange things to memory.

QUIKDRIV/6MS is the fourth program of the set. It offers a faster stepping rate for the read/write head of the disk drive, jumping from the built-in speed of 30 milliseconds to a hurry-up speed of just 6ms from track to track. Neither Danosoft nor I really recommend this speed, but it seems to be in

demand so it is supplied here. It does speed disk access time — great when you're doing a lot of on-and-off disk work (as with database applications), but it may also cause undue wear and tear on your equipment. I found with similar utilities years ago that DSKINI and BACKUP work a little funny with a 6ms step rate, and Danosoft warns against the same thing. Let the user beware, but nobody says you have to use it, and it isn't force-fed to you as in any alternate DOS.

QUIKDRIV/30M is a different sort of utility, one I can't seem to recall needing or even seeing before, but I think it grows on you. You've probably noticed that drives keep on running after they are accessed, and the red light stays on after the OK prompt appears on the screen. Fine, but for that two seconds, you can't access the drives while they spin down. This is a built-in function, like 35 tracks, left over from the Bad Old Days when CoCo drives were just slightly modified Tandy Model I hardware and not too dependable mechanically. Now the software retains these allowances for the old dinosaur drives only because it's too much work for Tandy to modify the DOS. (Is it time for a Color Extended Disk BASIC 1.3?) Anyway Danosoft comes to the rescue again with a little utility that shuts off the drives in about a quarter of a second, or 1/8 the usual time. Very handy for backup and copy functions.

SETFEED is the only program of the six that I couldn't find much immediate use for, but it may still be just the ticket for some jobs. It adjusts the characters per line and spacing between lines for just about any printer you can hook up to a CoCo. What can it be used for? I've grown fond of using it for program listings, of all things. If I'm modifying a long BASIC program, I can use SETFEED to put, say, four spaces between each line so I can pencil in comments or new code. And I can set the printer to keep each line just 32 or

40 characters long, to make "finger entry" easier for me or someone else. Maybe that's how they keep those 32-column listings so neat in THE RAINBOW!

OK, it's acid-test time. Are Danosoft's *Disk Utilities* compatible with the popular alternate operating systems? I tried to "stretch" a disk under CONVERT/DSK, then ran it on my "fussy" word processor to write this review. Then I cold-started the CoCo 3, booted up under my favorite alternate DOS (all right, it's SpectroSystems' ADOS-3), and loaded the word processor again. I still had 80 contiguous tracks (well, 78; two are used for the directory and its granule allocation table) and a full 78 granules per side. 100-percent compatibility and all the files were still accessible! What does this mean to you? Well, you can make an 80-track disk with the Danosoft disk utility of your choice and give it to a friend who uses another 80-track DOS, and you won't have to give him a pirated copy of these utilities just so he can use the files. Of course, at this price, who needs to pirate? (Just say *no* to hot software!)

Now the bad news. I usually dedicate a paragraph in every review to what I would change or what I don't like, but this time I haven't anything to say. Danosoft has developed a package of bug-free utilities at

## \* EXTENDED \* ADOS-3

### \* Built-in RAMdisk \* Point-and-pick file select menu \*

Not a new version of ADOS-3, but a new product that shares space with ADOS-3 in a 16K EPROM. Arrow-key selection of files to execute, LOAD, COPY, KILL or SCAN. The BACKUP command is doubled in speed for full disks, proportionately faster for partly full disks. (BACKUPS to or from the RAMdisk typically take 5 to 20 sec.) • BACKUP-with-format • Wild-card COPY and KILL, with optional prompting for individual files • Date (or date/time with hardware clock) displayed for files in the directory, printed on LLISTings • DATES function • Key repeat • Block move/copy of BASIC program lines • Text screen printer dump • Auto-reboot of a BASIC program or the DOS command • Parallel printing • Read/write/format 35/40 tracks on 80-track drives • Supports 3 double-sided drives plus 2 RAMdrives • Allows different numbers of tracks on different drives • Shares the original's excellent compatibility with commercial software. For 128K CoCo 3 with ADOS-3 (RAMdisk use requires 512K). Includes information on having an EPROM burned (cost is \$15) after configuring Extended ADOS-3. Disk, \$39.95. Extended ADOS-3 plus ADOS-3, \$64.95. Driver for Disto real-time clock, \$5. Adapter for controllers lacking 28-pin socket, \$10. SmartWatch real-time clock (Tandy 25-1033 equiv.), \$35 (Driver included; for 28-pin socketed controllers only).

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— Rainbow, October 1989.

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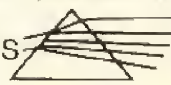
— CoCo Clipboard, Sept/Oct 1989.

### ADOS-3 (reviewed July 1987)

Customize default startup message, colors, screen width, baud rate, step rates, processor speed, number of tracks (35, 40, or 80). Disk I/O and printing are reliable at double CPU speed. Extra commands such as FAST, SLOW, AUTO, RUNM, SCAN, CAT, PRT ON/OFF, Keystroke macros, arrow-key scroll through BASIC programs, edit/repeat of last command, auto-edit of error line. ML monitor, lots more. Usable as a disk utility or in EPROM. 128K CoCo 3. EPROM-burning (cost is \$15-20) information provided. Disk, \$34.95.

### ADOS for CoCo 1 and 2 (reviewed June 1987) Disk, \$27.95.

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an incredible price. Users are warned that *Big Disk*, *DOUBLE40* and *CONVERT/DSK* overwrite the cassette access part of the CoCo's built-in operating system, but it's been at least nine months since I've even had the cassette plugged in; you other disk users probably don't use it much either. If you do need it, I suggest formatting the disk as you need it under the utility of your choice, cold starting your machine, and then copying your cassette files to the new disk conventionally. You can even use *BACKUP* or *COPY* later to move the files to the 10 new granules or the back of the disk.

If you've been holding out buying an alternate DOS because of cost or compatibility questions, or just didn't need all they offer, or you're just looking for a bargain on utilities, look no further! Danosoft offers must-have utilities at a can't-wait price.

(Danosoft, Box 124, Station A, Mississauga, ON L5A 2Z7, Canada, 416-897-0121; \$17.95 U.S., \$21 CDN, add \$2.50 S/H)

—Fred Toon

## Software

CoCo 3

### *The O.S.I.T.E. File*— Reporter Investigates Alien Rumors

As a reporter for a famous newspaper, you have been chosen to investigate recent occurrences at the Outer Space Intelligence Transmission Enterprises (O.S.I.T.E.). Rustan Straun, its president and CEO, has agreed to let reporters tour the top-secret interplanetary communications installation.

Your inquiring mind wants to know—what about the now-secret wings made inaccessible to the media? What about the disappearance of a scientist last seen here? Is it true that O.S.I.T.E. has contacted alien worlds? Just what is going on here? As you sit in the lunchroom with other reporters waiting for the tour guide, you decide to answer your own questions by embarking on a one-reporter tour.

*The O.S.I.T.E. File* is a graphics Adventure game on disk or tape for the CoCo 3. The disk is not copy-protected, easily allowing a backup play disk to be made. The three-page, typed instructions tell you to RUN "BOOT" to begin the program that "sets up the mainframe." BOOT asks what type of monitor you're using and then provides a detailed game scenario. After paging through the instructions you then load and run OSITE to start the game. Unfortunately you must

run BOOT the first time you play the game after a cold start because it sets up the graphics, etc. (I would like to see an option here allowing the experienced user to go straight into the setup without having to page through the three or four screens of instructions.)

*The O.S.I.T.E. File* is a typical Adventure responding to verb-noun commands,

### Proving O.S.I.T.E. and its president guilty of harboring alien intelligent life forms is the object here

such as GET KEY. Only the first three letters of each word need to be typed in to be recognized. As in most Adventures, you get an inventory of what you are carrying and also some help. A unique feature is the random VERB command. Type VERB and "a random verb is selected for the user's aid." Many times it seems the random verb is exactly the verb I need. The available directions are shown onscreen, and moving is accomplished with one-letter commands. A description of each room is given along with a simple graphic of the objects of interest.

Being a reporter, naturally, most of your important clues are found by snooping. You jot down clues in your notebook, which is accessed through the RECORD command. Typing in RECORD brings up a text screen with space for 15 lines of notes. It is important to take notes because, at the end of the game, you are asked a series of random questions. You must answer the questions correctly to win.

Proving O.S.I.T.E. and its president guilty of harboring alien intelligent life forms and exposing them as a counterfeit alien organization is the object here. Unfortunately I found doing that rather easy. I solved the game in four hours. I do not consider myself an expert Adventurer: I have solved Mark Data's graphic tape games, *Dallas Quest* and *Sierra On-Line* games yet have attempted many more games than I have solved. I find *O.S.I.T.E.* to be straightforward, very easy and possibly too generous with help. In fact I would have solved *O.S.I.T.E.* in less time had there been a Game Save feature eliminating the need to start at the beginning each time I died.

*The O.S.I.T.E. File* is in the spirit of graphics Adventures found within the pages of *THE RAINBOW*. In fact the author, Mi-

chael Anderson, has had two of his programs place third and fourth in the *RAINBOW Adventure Contests: The Adventures of Johnny Zero* and *The Park of Mystery*. I have not seen either of these programs so I cannot compare them to *The O.S.I.T.E. File*. Within the pages of *RAINBOW* or on the *RAINBOW Adventure* tapes, *The O.S.I.T.E. File* would be a great beginner's Adventure, but I don't feel that it stands alone as a \$19.95 program. It is just difficult enough (you die once or twice) and yet not too hard for a novice Adventurer. If you have more than one or two Adventures under your belt, *The O.S.I.T.E. File* will leave you wanting.

(Tothian Software, Inc., Box 663, Rimersburg, PA 16248; \$19.95 plus \$2 S/H)

—Kay Cornwell

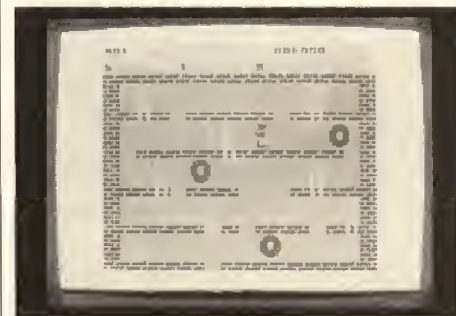
## Software

CoCo 1, 2 & 3

### *Donut Dilemma*— Sharpen Your Sweet Tooth!

There is trouble at the donut factory when angry Angelo has the machines running out of control. Your mission in *Donut Dilemma* is to enter the building from the bottom floor and work your way up, battling the crazed machines until you reach the top floor. There you must shut down the factory's generator, thus restoring law and order.

Along the way you encounter many maniacal machines such as fat spurters, sugar sprinklers, conveyer belts and even a berserk bucket. Monstrous donuts are there



to thwart your progress. If you pick up a bag of donut mix, you can "pop" the evil donuts by throwing it at them. After you destroy the mad donuts, you are able to climb ladders, jump platforms and ride elevators to reach the top floor where the power generator is located.

Have I mentioned that you must not

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forget to turn on the three circuit breakers to activate the elevator in order to leave each room? This is not necessarily an easy task! Each floor level is depicted with a variety of ladders, walkways and devious donuts that you must outwit in order to proceed. There are some rather clever obstacles. The game requires patience to solve some of the dilemmas, speed and accuracy to solve the others.

*Donut Dilemma* is a simple, enjoyable arcade game. It has 10 colorful screens to keep you on edge. The game starts out easy to play, then becomes progressively harder to master. I was able to get to the third level before I became bogged dough-deep in trouble. There is a practice game feature that gives unlimited lives to help you learn the ropes.

My two sons, ages 12 and 15, enjoyed this game for hours, trying to conquer it — not as easy as it first might seem! *Donut Dilemma* uses the keyboard for control. This game is designed for older children (and adults) who have the dexterity to manage the keys. Instructions are provided to have you playing the game within minutes, but mastering the keys requires some practice.

*Donut Dilemma* was originally designed for the Tandy Color Computers 1 and 2, but has been updated to work on the CoCo 3. It requires a disk drive and can be used with a TV set or RGB monitor.

(Game Point Software, P.O.Box 6907, Burbank, CA 91510, 800-877-2232; \$19.95 plus \$3 S/H)

## Software

CoCo 3

### *Disk Handyman*— CoCo 3 Utilities

*Disk Handyman*, despite its sexist title, is about as user-friendly as a CoCo 3 utility can be. The package's cover letter recommends that you run *D0CS* first.

*D0CS* has all the documentation needed, and you can whip through it in just a few minutes. Being a typically cautious CoCoist, I made a backup copy of the disk before I loaded any of its programs into my trusty machine. Since I don't own any of the lightning-speed, one-pass backup utilities one sees advertised in *THE RAINBOW*, my backups take about five minutes of computing time and numerous flips of the single-drive door latch as I obey the CoCo's prompts. *Disk Handyman* makes a usable

copy in three passes, taking three minutes or less on a single drive. You are also given the option to work with 40-track disks. People with 512K CoCos can knock a copy off in a single pass.

Since there are other utilities on the market that back up a disk in one pass on a 128K system, this three-pass option might not seem impressive. What is impressive, if you or a friend happen to possess a Multi-Pak, is the ability to copy disks between two computers, using each of your Drive 0s. Using two slots of the Multi-Pak for the disk controller interfaces, *Disk Handyman* treats one drive as Drive 1 and the other as Drive 0. If that doesn't seem like enough value for \$25, read on.

The Read Error routine is handy for counting the number of read glitches on a disk. The target disk is zipped through rapidly, and the contents are flashed on-screen in an impressive blur. The routine pauses for input whenever a granule error is encountered, and at the end you get an asterisk (\*) for each error found. I fooled around with this for a while, but — considering the lockout routine that follows — I found no real need for it.

The lockout routine offered by *Disk Handyman* also finds the aforementioned glitches. The bad granules are then locked out so data isn't stored there, avoiding grief later when you attempt retrieval. For a partially filled disk that you don't want written to by mistake, this routine also locks out all available space. Be certain, however, that you don't plan on using any more space on the target disk since the procedure is apparently irreversible.

If you have a disk with a DOS track, you are given the option to auto-execute any BASIC program on that disk by entering *D0S*. If you start to encode a disk with the *D0S* command and the routine finds something already on the DOS track, it advises you that something is there. Pause here to decide if you want to continue encoding your disk so it will auto-execute the program of your choice. Chances are there is a favorite BASIC program living on the DOS track. Chances are you will kill that favorite program if you continue the encoding sequence, so follow the prompts carefully to avoid problems.

To sum up: Except for a few minor spelling errors in the documentation, *Disk Handyman* is a well-prepared utility for the CoCo 3. If there were a routine included to reverse the granule lock utility, it would be a more complete package.

But the program does exactly what it claims to do. Functionally it's built like a sports car, speedy in operation and difficult to crash. Pricewise, it compares fairly to similar offerings.

(Micro Data Systems, 205 Baldwin Ave., Princeton, KY 42445, 502-365-3967; \$24.95 plus \$3 S/H)

—Mike Shay

## Software

CoCo 3

### *Milestones*— Card Game and French Lesson in One

*Milestones* is a new CoCo 3 card game from JR & JR Softstuff. It comes on an unprotected disk with five sheets of instructions (and hints). The object of *Milestones* is to win a 1000-mile road rally.

A road rally is a type of race that is won on points and not necessarily by crossing the finish line first. When the game boots, the player is given the options of joystick or keyboard interface, RGB or composite monitor, and the name of the player. Next



the board screen comes up and the player is told the computer is shuffling the deck of 106 cards. There are four categories of cards: distance cards to move; hazard cards to slow or stop the computer; remedy cards to offset the hazard cards; and safety cards to protect from the use of hazard cards. Points are awarded for miles traveled, the playing of safety cards, finishing the rally first, making a safe trip, achieving a shut-out, and completing a *coup force* (the French lesson is coming).

The screen is divided into three sections; the left side displays miles traveled, speed limits and status. The right side of the screen is the CoCo's, and the bottom center of the screen displays the cards in the player's hand.

As stated above, either joysticks or the keyboard can be used to play. I prefer the keyboard because it seems easier and faster than using my joystick. The game is really very simple. You begin a turn with six cards in your hand, draw a seventh card by



pressing ENTER, then if possible play a card to move your car. If there are no playable cards, one card must be discarded.

There is one exception to this play (now it's time for the French lesson). Suppose that dirty-playing CoCo plays a hazard card — say a "flat tire" card — on you, and you are holding the "puncture proof" safety card. You can play that "puncture proof" card before drawing another card. This play is called a *coup forre* (pronounced *coo foo-ray*). You receive 100 points for playing the safety card and 300 points for the *coup forre* and get to watch the screen turn all different colors. *Coup forre* is a French fencing term that basically means if your opponent tries to smack you upside of the head, you block him and then smack *him* in the side of *his* head (French isn't so hard).

*Milestones* is a card game, so no matter how good a player you are — or the CoCo is — the deal of the cards can have a lot to do with the outcome of a game. The results of the games I played ranged from my winning big to my losing badly, with some very close games too. Since every game is different because of the deal, *Milestones* is not so simple that you will get bored with it, nor so difficult that you will get frustrated with it. To be honest, I took satisfaction in playing "accident" cards on my CoCo and

imagining it running into the wall at 200 mph after some of the beatings it gave me. So if you're into card games with a twist, consider *Milestones* for your CoCo library. The price is right.

(JR & JR Softstuff, P.O. Box 118, Lompoc, CA 93438, 805-735-3889; \$19.95 plus \$3 S/H)

—Steve Griffith

## Software

CoCo 1, 2 & 3

## Hardware

# Lyra 2.62— An Upgraded CoCo MIDI Sequencer

The union of electronic computers and electronic sound synthesizers has been in existence for nearly as long as electronic computers have been around, but only recently has this powerful combination been available to the average consumer. With the CoCo and since the introduction of *Lyra* just four years ago by master pro-

grammer Lester Hands, this marriage of computers and synthesizers is not only available to *all* 64K CoCo users but *very* accessible as well.

*Lyra* (currently available as Version 2.62) is a combination software and hardware package that gives the electronic musician access to the latest MIDI functions available in MIDI-compatible synthesizers, while at the same time offering an operating



environment that even the beginning music student will find easy to use. All music data in *Lyra* is graphically displayed in standard music notation. A Macintosh-style, point-and-click, menu-driven environment makes *Lyra* easy to learn and use.

*Lyra* works with any CoCo with a minimum of 64K, a disk drive (Radio Shack Disk Extended Color BASIC required), and

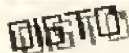


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See page 122, March 89 Rainbow for more info

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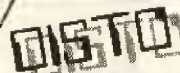
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a mouse or joystick. The *Lyra* editor is displayed on the high-resolution PMODE 4 screen (your choice of buff and black or green and black display colors). The display is acceptable on a TV or composite monitor. But since *Lyra* makes no use of "artifact" colors, the display works very well (and of course is much sharper) on an RGB monitor. If *Lyra* is running on a CoCo 3, it automatically puts itself into double-speed mode, allowing for faster editing and faster playing tempos, but it does not take advantage of any additional CoCo 3 features or memory. In an effort to make *Lyra* a better MIDI sequencer, once-compatible non-MIDI devices such as Tandy's *Orchestra 90* and Speech Systems' *Symphony 12* are no longer supported.

*Lyra* comes on a non-copy-protected, single-sided disk and includes a special six-foot MIDI cable that connects between the CoCo's four-pin serial port and the standard five-pin DIN MIDI IN port of a MIDI-capable instrument (most MIDI instruments have both MIDI OUT and MIDI IN ports and sometimes a MIDI-THRU port as well; your instrument must have a MIDI IN port to work with *Lyra*). *Lyra* is also compatible with the CoCo MIDI Pack previously available from Speech Systems and now offered as a part of the *CoCo MIDI 3*

package from Rulaford Research. There is a very readable 35-page manual that adequately covers all of *Lyra*'s features. The *Lyra* disk includes ready-to-play sample music files along with a printer utility for printing *Lyra* music scores on a dot-matrix printer. Printers currently supported include Tandy, Epson and Okidata 92; the manual has a listing of relevant printer codes to assist users with printers not on the list.

*Lyra* is a professional-quality, graphics-oriented, eight-voice MIDI composition system (not a MIDI recorder) for creating playable music MIDI data. While it does have the capability to play, to a limited extent, through the television/monitor speaker (or audio jack on the CoCo 3), *Lyra* really struts its stuff when used in conjunction with a MIDI-capable synthesizer.

To say it another way, if you have a CoCo with at least 64K and a MIDI synthesizer, you *must* have *Lyra*. To take the greatest advantage of all of *Lyra*'s features, your MIDI synthesizer should be eight-note polyphonic, multi-timbral and velocity-sensitive (meaning it can simultaneously play eight notes with eight different sounds and allow MIDI control of individual sound volumes).

A simple LOADM command gets the all-machine language program up and running.

Most of *Lyra*'s screen is devoted to its display of a grand staff, the pairing of two five-line music staves divided into bass and treble clefs as is standard in transcriptions for piano. Key and time signatures are displayed in standard format as well as bar lines connecting the two staves. Musically speaking, with *Lyra* what you see is what you get. Across the top of the display is a menu bar for instant access to a host of editing, playing and file-management features. Along the display's bottom are a selection of notes and rests, with corresponding values from

whole to 64th. Aside from menu boxes that open and close during the course of operations, you never lose sight of this main display.

Entering music into *Lyra* is as easy as pointing and clicking. To place a note anywhere on the grand staff, you first select the desired note value (whole note, quarter note, etc.) by moving the cursor to the note options at the bottom of the screen, positioning the cursor over the desired value and clicking the mouse or joystick button once. The cursor then becomes the selected note value. If you then want to enter that note value as a Middle C, for example, you position the cursor (which looks like the current note value) at the Middle C position between the bass and treble clefs and click once. A copy of the note is made at the correct position. Click again, and you've entered another note, and so on. This pointing and clicking is the essence of *Lyra*'s interactive, graphics-oriented environment.

Of course there is much more to *Lyra* than simply picking up notes and putting them on staves. With room enough for over 14,000 notes/events — and because *Lyra* allows for up to eight separate voices — you can compose and play up to eight simultaneous lines of music, or compose music with full eight-voice chords. All eight lines/voices of music can be displayed and played simultaneously, or you can select just the voices you want to see and hear. Once you have entered some music, a host of editing features goes beyond simply inserting and deleting notes. Using block-editing functions, entire sections of music can be copied, moved, transposed and deleted. The block editing functions can be selected to act on all the voices or just the voices you choose. You can scroll through the music a note at a time or jump directly to specific measures or relative positions in the composition. Music can be played at any time and from any position in the composition during the editing process.

All the standard music composition tools are available in *Lyra*. The grand staff spans over four octaves, and you have the option of raising or lowering voices an additional octave. All key signatures are available as well as sharps, flats, accidentals and naturals. You can define most time signatures, with the exception of signatures where the upper number is greater than the lower number (such as 12/8) and some with odd numerators (such as 7/4). The velocity (loudness) of each voice can be controlled and modified throughout a composition. Tempo is controlled locally through the insertion of individual tempo indicators, and a Master Tempo controls the overall tempo.

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There is an easy-to-use instrument table for the inclusion of 16 different instrument sounds. Working in somewhat the same way as the CoCo 3's color PALETTE feature, you can establish a palette of 16 instrument sounds (drawn from however many instruments are available on your particular synthesizer) and assign a specific instrument to each of the eight voices. These instrument-to-voice assignments can be changed throughout the composition. Please note that velocity or instrument selections are ignored when playing *Lyra* through devices other than MIDI synthesizers that are sensitive to such inputs.

All of the file-management controls are also accessed by *Lyra's* point-and-click interface. Disk drives can be selected; directories displayed; and files loaded, saved, appended and deleted. While instrument tables are automatically saved with each music file, they can also be saved and loaded separately. If you want continuous play of all the *Lyra* files on a disk, a Play All option automatically loads and plays *Lyra* files in the order they appear in the disk directory.

For more advanced use *Lyra* allows access to MIDI features that go beyond basic channel selection and program changes. Velocity is controlled through eight dynamics indicators (*ppp* through *fff*), each of which can be defined as having a value from 0 to 127. There is a powerful Filter option that allows you to withhold up to five different kinds of MIDI events during play. An optional MIDI clock is included for use with MIDI drum instruments. For MIDI control at the byte level, individual MIDI byte messages can be output from anywhere in the music. In addition, each *Lyra* file is allowed up to four multibyte MIDI event messages that can be custom-made for your particular synthesizers and can be continuously called upon during play. If you would like to create a MIDI event that has a very large number of bytes, a BASIC file of MIDI bytes can be created and called upon from *Lyra*.

While *Lyra* is not as feature-packed as some sequencing software offered (at much higher prices) for other computers, it is an impressive demonstration of the CoCo's capabilities. *Lyra* is a program that has come a long way, and it is still in the process of enhancement and improvement. While some earlier *Lyra* versions had a few annoying quirks, the latest version is in all operations crash-proof.

I use *Lyra* a great deal. If I had to think hard about possible faults, one thing I would mention is that there have been a few, very rare instances in which *Lyra* was suddenly unable to recognize and load one of its own files. Here the solution is the same as for

any computer operation: Always maintain current backup copies of everything. The only other minor fault I've come across is that in the Goto Measure option, if you accidentally enter too many digits, unwanted characters appear on the display, but these have never caused file damage and can be cleared by saving the current file and re-booting the program.

One special note should be made concerning the difference between *Lyra* versions 2.61 and 2.62 that is not mentioned in the manual: Version 2.62 includes the addition of "stay awake" MIDI signals to accommodate certain MIDI instruments that automatically turn themselves off if they don't receive any MIDI input after a certain amount of time. Under certain circumstances, during play this feature causes notes in the first measure of music to come on and then abruptly shut off, with the music then playing normally from the second measure onward. The remedy is to make the first measure of a composition a measure of rests and have all the music begin in the second measure. This is a good practice regardless, because by placing all the initial program changes and other MIDI data at the beginning of the first measure and starting the music in the second measure, your synthesizer has time to fully configure itself before the music begins playing.

Beyond being an outstanding benchmark quality CoCo MIDI music composition program, *Lyra* defines a quality standard in overall programming features. *Lyra's* combination of power, speed, efficiency and ease of use makes it a model from which all CoCo program writers should find inspiration. For amateur and professional maestros, *Lyra* really does the job.

(Rulaford Research, P.O. Box 143, Imperial Beach, CA 92032, 619-690-3648; \$59.95)

—Walter Myers

## Book

### *The Lyra Companion—Expert Help for the Lyra User*

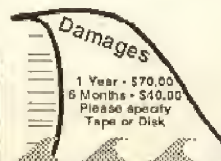
Attention *Lyra* users: Did you know that there is more to *Lyra* than just what's printed in the *Lyra* manual? Did you know that key signatures can be changed in the middle of a composition? Or that there are ways to compose using unusual time signatures such as 12/8 or 7/4? Did you know that help is available for everything from transcribing a song to using advanced MIDI control techniques? You will find this and more in *The Lyra Companion*, a new book by musician and author Michael Stute.

*The Lyra Companion* is a soft-bound laser-printed handbook with over 100 pages of helpful information and illustrations just for users of the popular *Lyra* CoCo MIDI music editor by Lester Hands. *The Lyra Companion* is written by a professional rock guitarist and studio musician who has



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been an enthusiastic user of the CoCo and *Lyra* since their beginnings. As a professional musician, Mr. Stute has written nearly 300 songs and independently produced two of his own albums with *Lyra* controlling all the MIDI instruments. He currently uses *Lyra* exclusively for all his songwriting. Born of the author's professional use of *Lyra* and also his correspondence with Lester Hands, *The Lyra Companion* is filled with information for beginning to advanced users.

Suggesting you first read the *Lyra* manual and familiarize yourself with *Lyra*'s operating environment, *The Lyra Companion* begins by taking you option-by-option through *Lyra*'s features. All the basics are covered, from the first LOADM"LYRA" to instrument and voice selection, to advanced file management and block editing techniques. Current up to *Lyra* Version 1.60, the book also advises you when features and options in this version of *Lyra* differ from earlier versions.

Once you have gotten a handle on the fundamentals, you are introduced to techniques for transcribing existing music (such as a classical piano transcription) into *Lyra*. You are shown how to keep a transcription log and how to create a "structure map," a method for identifying, sorting and labeling different parts of a song. By keeping a transcription log you can take on and be in control of even very large projects, consistently making the best use of your time and *Lyra*'s abilities. If you want to compose some of your own music, *The Lyra Companion* details steps for transcribing music you hear in your "mind's ear."

Helping you to expand *Lyra*'s capabilities is detailed information on special edit-

ing techniques going beyond the confines of the *Lyra* manual and drawing from the author's real-world *Lyra* experience. For example, while the manual states that key signatures can be defined only at the beginning of each song file, you are shown how they can be changed in the middle of a composition as many times as you like.

Procedures are provided for taking advantage of *Lyra*'s ability to output specific user-defined MIDI codes, allowing you to get "inside" your synthesizer and effect changes from *Lyra* to any MIDI-controllable feature

Solutions are outlined for another inherent *Lyra* limitation: the inability to enter time signatures in which the top number is larger than the bottom number (such as 12/8) or in which the top number is odd (such as 7/4). Step-by-step procedures are described for making *Lyra* work with these unusual (though not unknown) situations. Continuing to go beyond the *Lyra* manual, there is information on different ways to create *staccato* effects, and a method is offered for simulating *legato*. If your synthesizer has no "pedal" mode, a straightforward method for creating true pedal effects is described and illustrated.

While note entry, instrument selection, tempo and velocity controls available to all *Lyra* versions are thoroughly explored, *The Lyra Companion* also delves into the mysterious world of "MIDI events" and "MIDI bytes," options available in the latest versions of *Lyra*. Here explanations and procedures are provided for taking advantage of *Lyra*'s ability to output specific user-defined MIDI codes, allowing you to get "inside" your synthesizer and effect changes from *Lyra* to any MIDI-controllable feature. There is advice on how to read MIDI implementation charts and help for finding your way through the maze of binary, decimal and hexadecimal MIDI codings. For transmitting large amounts of data to your synthesizer, you are shown how to create and call upon a BASIC file from *Lyra*.

Speaking of synthesizers, *The Lyra Companion* goes beyond *Lyra* operations and explores the world of MIDI instruments. MIDI and MIDI sequencers are defined, and synthesizer fundamentals are explained. Here you are privy to the wealth of the author's practical knowledge. Capabilities such as *monophony*, *polyphony* and *multi-timbre* are explained. You learn what it means to put a synthesizer into different modes and what the differences are between four-, eight- and 16-voice capabilities. There are step-by-step instructions for getting the most from your system, and trouble-shooting advice is given for specific problems you may encounter along the way. If you're considering a synthesizer purchase, there is information on features to consider, how they relate to *Lyra*, and what you should expect to pay for certain abilities.

*The Lyra Companion* covers a lot of territory and touches upon nearly everything that is *Lyra*, MIDI and music. It attempts to fill a real need in the CoCo music community, and in doing so it tries to fill very big shoes indeed. In light of such high expectations, there is some room for improvement. Information is very accessible in presentation, but there are some flaws in content. While the text appears to have had the benefit of a spelling checker, there are a number of content errors that may be confusing to the beginner.

The writing style is also at times distracting; I get the feeling the author is a musician first and a writer second. Complicated subjects are frequently taken on, but sometimes the explanation ends up more complicated than the subject.

In another area of concern, *The Lyra Companion* has chapters on music theory for the beginning student of music. Indeed, *The Lyra Companion* accommodates readers who know nothing of *Lyra* or music. Covering everything from music notation, to scale and chord theory, to help with harmonizing your own songs, *The Lyra Companion* makes a commendable attempt at being a music theory tutorial as well as a *Lyra* handbook. While a fresh perspective on music fundamentals is of value to even the experienced musician, I found the music theory discussions to be at times unnecessarily complex and occasionally even misleading. For example, the 12-tone chromatic scale is described as having "15 notes"; whether this is a reference to certain "named" notes or key signatures or just a typographical error is not clear. *The Lyra Companion* would benefit from a lot less theory and more of the author's valuable practical experience.

As it stands, *The Lyra Companion* is off to a promising start. It is clearly indexed,

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nically presented and contains a wealth of useful information for the *Lyra* user at any level of experience. This is one "companion" to keep by your side.

(Rulaford Research, P.O. Box 143, Imperial Beach, CA 92032, 619-690-3648; \$9.95)

—Walter Myers

## Hardware

### TelePak II— Next-Generation RS-232 Pack

As with many other support items for the CoCo that Tandy has stopped selling, a third party has stepped in to fill the void. In this case it's the disappearance of the Tandy RS-232 Pak. TelePak II, an RS-232 pack by Orion Technologies, is an updated version of TelePak and TelePak+, which were reviewed in April 1989's RAINBOW.

The first thing that struck me about TelePak II was the design and neatness of

it. I'd been running an older Tandy RS-232 Pak, and TelePak II is half the size. Terrific! It makes it a little more difficult for the cat to dislodge it when he walks across my CoCo. The unit is a nice cream color so it blends in and makes all those pieces of equipment seem like a whole. TelePak II also comes with the necessary cable and standard DB-25P connector attached to the pack.

It's very evident that some thought went into the placement of the cable on the pack. If TelePak II is plugged directly into the console, the cable goes straight back instead of up and over. If it's plugged into a Multi-Pak, the cable goes out the right side of the pack and back. In either case the cable stays nicely out of the way, so I can't knock against it as easily while reaching across my crowded computer desk for something. Orion Technologies has printed its address and phone number right on the label fixed to the pack. How much time have you spent searching for a manual or warranty card when you needed to call a company for help? No problem with this company, even if you do lose the manual.

Continuing with my examination of this product, I noticed it has a gold-plated edge connector. Because I like to know what makes things run, I peeked into the inner

workings (something that voids the 30-day warranty). But I got special permission to peek from the company when I called to verify the price. I found the support people eager to help in any way they could.

Now, on to the inside. Comparatively there are very few pieces and parts inside. That's good—it means fewer parts to give you trouble. I have to admit that I don't know my way thoroughly around chips and circuitry, but I can recognize some of the more important pieces. The TelePak II has a voltage converter built in so it can be used with any CoCo. Also, the chips that do the most work are socketed for easy replacement if anything goes wrong.

Orion guarantees the pack for 30 days. If the warranty expires you can have the unit repaired or replaced for a service charge any time up to six months from the date of purchase.

TelePak II will set the carrier detect on your modem on high if it needs to be; and it works with either Disk BASIC or OS-9 software and any Color Computer, Multi-Pak or Y-cable. If you happen to have a rare modem and can't get the TelePak II to work with it, call Orion Technologies for help.

The packaging looks nice, and the working parts look sturdy enough—but does it work? I tested TelePak II on a CoCo 2 with

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### Price List

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|---------------------------|----------|
| Model 101                 | 35.95    |
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a couple of terminal programs and two different modems. I used an Avatex 1200 and a Capetronics with *Mikeyterm* and *Greg-E-Term*. I then enlisted the help of one of our local users group members, who tested it on a CoCo 3. There were no problems with either machine, either computer-to-computer or using any of the area BBSs. Admittedly I didn't test it at speeds over 2400, nor could I test it with all the available modems and communications programs. But based on its performance with those I used, I believe it will work with most anything.

The manual explained the warranty information, features and installation procedure (all necessary, I suppose, for first-timers), with the last three pages devoted to cable wiring, pinouts and programming information for those of you who are interested in that. Programming the pack isn't necessary, though, because it already functions identically to Tandy's RS-232 Pak.

I recommend TelePak II because of its sturdy construction, attached cable and connector, the very reasonable price and the company support that is only a phone call away. This is definitely a good buy.

(Orion Technologies, P.O. Box 63196, Wichita, KS 67203, 316-946-0440; \$49.95 plus \$3 S/H)

—Gail Allore

executes, loads the default war and starts off at the main menu. There you have a choice of 16 options to get you started. The default war is totally blank, one in which you create your own maps and icons, edit your own armies, etc. If you want to play immediately, you can load one of five ready-to-run wars. You can choose a me-

I created some of my own terrain icons and was able to create detailed runways complete with yellow lights and a white center stripe — even a helicopter landing pad with a circle and an X in it. They looked great on the map

dieval battle with knights in shining armor, a recreation of the biggest battle in the Civil War, a WWI battle, a WWII battle or a "future" confrontation.

I loaded the Civil War battle first. As the battle map came up on the screen, I was a little disappointed that the icons were in black and white (black for the black army, white for the white). I have seen other programs in which the icons are colorful and detailed. I switched to the world map and again was disappointed, this time by the appearance of a screen that looked as if it were composed of ASCII graphics on the CoCo 2 screen but more detailed. However, after beginning game play, I realized these were just aesthetic details with no bearing on the outcome of the game.

I do feel the graphic screens could have been better implemented. From what I am able to tell, it appears the 320-by-192 setting is used. The screen area used for the graphics is roughly the size of the old 32-column text screen. The rest of the screen is just wasted.

I do want to compliment Mr. Wittmeyer on the terrain graphics. They are really good. I created some of my own terrain icons and was able to create detailed runways complete with yellow lights and a white center stripe — even a helicopter landing pad with a circle and an X in it. They looked great on the map.

I would like to have seen a Fill feature — one that would let me draw an outline and then fill it with a color, rather than having

to change each block by hand.

Creating your own war is probably the most fun. I can create any type of scenario I envision, with units from cannons, magicians and dragons to space ships. One of my scenarios I set in modern times. I designed helicopters, jet fighter planes, bombers, nuclear ships, naval transports, tanks and infantry. I designed my map from scratch. Playing against the computer proved to be humorous: It did not use the naval transports to carry the tanks across the ocean but, rather, had the tanks out in the ocean as if they were ships. I could have adjusted the tanks' attributes to prohibit them from crossing water, but that would only have resulted in their staying on the mainland.

A word of advice: When you are in the process of creating units, write them up on paper first. When all the units are complete and meet with your satisfaction, then put them in the CoCo. This saves re-editing.

The 22-page manual accompanying *A World at War* is well-written, taking you step-by-step through each menu option. If you have never played a game like this one, the manual is invaluable.

Because of the difference in colors on my monitor, I wrote a letter to Mr. Wittmeyer describing my problem. His answer was prompt, informing me that with a disk editor program I can change the color values on a working disk (*never* edit the original). I was unable to make the changes due to the lack of foresight on my part. (I never thought I would need a disk editor.) I am in hopes that Mr. Wittmeyer will incorporate a prompt at the beginning of the program to allow users to identify their monitor type and let the program make the necessary adjustments.



All in all, I enjoyed *A World at War*. If you do not have a war-designer game of this type, I recommend this one. Mr. Wittmeyer has done well with the program. I look forward to seeing what else he offers in the future.

(GSW Software, 8345 Glenwood, Overland Park, KS 66212, 913-341-3411; \$25)

—Greg Snow

## Software

CoCo 3

### *World at War— Global Conflict and the CoCo*

Well, what's in the mailbox today? Let's see: bill — bill — junk mail — ah, my new issue of *RAINBOW* — bill — *great*, a new review assignment. This is going to be a wonderful day. I can't wait to see what this one is.

Opening the package, I find a program called *World at War* from Greg Wittmeyer of GSW Software. It consists of a 5¼-inch disk and an instruction manual. The disk is not write-protected — refreshing. A CoCo 3 with at least 128K, a disk drive and a TV/composite monitor are the minimum requirements. Joysticks are optional. Because the program has been written for the CMP mode, my CM-8 RGB monitor does not always yield the colors described in the manual.

Starting the program is as easy as entering LOADM"WAR". The program automatically

The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, your assurance that we have seen the product and have ascertained that it is what it purports to be.

◆ **1988 CoCo Federal Tax, 6th Ed.**, a tax-preparation program for the 1040 form, schedules A, B, C, D and E. Also covers Form 4562. Requires a CoCo 1, 2 or 3 with 64K and one disk drive. *Puritas Springs Software, The Ameritrust Building, 17140 Lorain Ave., Cleveland, OH 44111, (216) 251-8085; \$39.95.*

◆ **Action Arcade Pack, Volume 1**, a set of two public-domain games, *Laser Blitz* and *Kung Fu Fighter*, for 64K CoCos. In *Kung-Fu Fighter*, players punch and kick their way to the Shao-Min temple. In *Laser Blitz*, players adjust horizontal and vertical laser cannons to blast alien invaders. *Christopher English Communications, 40-25 College Point, Blvd. #8G, Flushing, NY 11354, (718) 445-6589; \$9.95 plus \$3 S/H.*

◆ **CIH Pages**, a CoCo 3 desktop publishing program with 256 fill patterns, 24 fonts and a collection of clip art. Features a point-and-click, pull-down menu-driven interface with dialog boxes and icons. Requirements include a 128K or 512K CoCo 3, an RGB or mono monitor, at least one disk drive (two recommended), a Tandy Hi-Res Joystick Interface, joystick or mouse and a printer (supports DMP-105, NX-1000, Gemini and Epson compatibles). *Coless Computer Design, dist. by Microcom Software, 2900 Monroe Ave., Rochester, NY 14618, (800) 654-5244; \$49.95, \$59.95 with Hi-Res Interface, \$79.95 with Hi-Res Interface and mouse.*

◆ **CycleJump**, an arcade game written in BASIC for the CoCo 3 that has users gunning motorcycles up ramps, over barrels and across El-Gato River Canyon. Requires a CoCo 3, a disk drive and a joystick. *J.T. Rawlinson Software, #361 St. Germain Ave., Toronto, ON M5M 1W6, Canada (416) 782-5718; \$14.95 plus \$2 S/H.*

◆ **Data Form III**, a program that lets CoCo 3 users create customized databases with up to 17 fields and that can use up to 63 granules for storage space. *E.Z. Friendly Software, 118 Corlies Ave., Poughkeepsie, NY 12601; \$19.95 plus \$1.50 S/H.*

◆ **Easy-Type 1.1**, a CoCo 3 shareware program that emulates an electronic typewriter. Features include word wrap, a save/load function, a line/page editor and selectable baud rates. *Christopher English Communications, 40-25 College Point, Blvd. #8G, Flushing, NY 11354, (718) 445-6589; \$5 for unregistered version, \$10 for registered.*

◆ **File System Repack**, a collection of utilities for defragmenting/optimizing OS-9 floppy and hard disks. Features command-line options for reclaiming "lost" sectors. It sorts files in order of increasing file descriptor sector address. Requires OS-9 Level I or II system with at least one disk drive and 42K free. *Burke & Burke, P.O. Box 58342, Renton, WA 90058, (800) 237-2409; \$29.95 plus \$3 S/H.*

◆ **K1 Librarian**, a program by Allen Huffman that allows users to transfer voice patches between a CoCo and a Kawai K1/K1R/K1M synthesizer. Requires a CoCo with at least 32K, a disk drive and the CoCo MIDI Interface or compatible. *Rulaford Research, P.O. Box 143, Imperial Beach, CA 92032, (619) 690-3648; \$29.95.*

◆ **KJV on Disk #2**, the book of Genesis, chapters 30 to 50, of the King James Version of the Bible on disk in ASCII files for the CoCo 1, 2 and 3. *BDS Software, P.O. Box 485, Glenview, IL 60025, (312) 998-1656; \$3.*

◆ **Slam Bam**, a one- or two player slamdunking game for the CoCo 3. Features a

High Score board and 27 kinds of slams. Requires a 128K CoCo 3, a joystick and a disk drive or a cassette player. *Erich Sweaney, P.O. Box 45434, Tacoma, WA 98445, (206) 535-9733; \$10.*

◆ **Studio Works**, a digital sampling/editing system that features up to 56 sound samples in memory at once (on a 512K CoCo 3). Includes a sequencer, a clipboard for cutting/pasting sounds, a "speaking clock" demo and a utility to load and play *Studio Works* files from machine-language and BASIC programs. Requires at least a 128K CoCo 3, a disk drive, joystick or mouse, and an optional cable (one end plugs into the left joystick port; the other end can be attached to a home stereo or "Walkman" source). *Oblique Triad, 32 Church St., Georgetown, ON L7G 2A7, Canada (416) 877-8149; \$54.95 U.S. or \$64 Cdn., with cable; \$39 U.S. or \$49 Cdn., without cable.*

◆ **Supersound**, a menu-driven sampling program that records sound in both single and double tracks. An included cable connects cassette recorders or radios to the right joystick port. Sounds can be edited, looped and played backward. The manual includes instructions for adding sound to your own programs. With *CoCo Max III*, graphics animation is possible. Requires a CoCo 3 with at least 128K; 512K is supported for longer recordings. *Supersoft, Inc., 363 Oakwood Ave., Jackson, MI 49203, (517) 787-3610; \$39.95 plus \$2.50 S/H.*

## ◆ First product received from this company

The *Seal of Certification* is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the program does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW reviewers for evaluation.

—Lauren Willoughby

This is the final installment of a three-part tutorial series exploring the icon editor *MaxIc*. It should help you write a few *Multi-View* based application programs in BASIC09. The source code and packed binary code is available on the August issue of RAINBOW ON DISK. The code may also be downloaded from the Rainbow section of Delphi's OS-9 Online database.

BASIC09 is a natural tool for modular programming. This makes it much easier to break down big projects into small manageable ones. *MaxIc* contains 27 modules. This month we'll look at the last nine files: `geticon`, `saveicon`, `readicon`, `showicon`, `writeicon`, `editor`, `updatbuf`, `errmsg` and `loadbar`.

I have attempted to publish *MaxIc*'s modules in groups that work together. This project wraps up with the icon editor and the modules needed to get, read, show, save and write icons. I'll discuss a few miscellaneous modules first.

### Telling the User What You're Doing

The short module `loadbar` helps *MaxIc* let the user know what it is doing. You see its output when you pick up an icon from the icon directory with the mouse and move it into the edit window. After the load button appears and you push the mouse button, `loadbar` writes the name of the icon over the edit window. Then it prints the message `Loading Icon` in the edit window.

The procedure `loadbar` is run by the procedure `readicon`. The name of the icon is passed to `loadbar` in the name field of the variable `IC`. `IC` has been dimensioned as type `MIC`, one of the two special data types used throughout *MaxIc*. A variable of type `MIC` holds a 32-byte long string, a single byte and two integers that hold the *x* and *y* position of the cursor.

The `loadbar` procedure begins by using the `param` statement to reserve room for the string containing the name of the icon it expects to receive from `readicon`. It then uses the `gfx2 color` command to change the foreground and background colors and the `gfx2 bar` command to draw a filled box over the edit window. This done, it uses the

### *A deeper look at MaxIc's modules*

# Clearing the Board

By Dale L. Puckett  
Rainbow Contributing Editor

`gfx2 curxy` command to move the cursor into the bar where it uses BASIC09's printing facility to center the name of the icon.

Now `loadbar` reverses the foreground and background colors and moves the cursor into the edit window where it prints the message `Loading Icon`. You'll see the message until the routine drawing the fat-bits icon in the edit window covers it up.

### Reporting Errors

The procedure `errmsg` gives *MaxIc* a universal method of reporting errors and is used by many of *MaxIc*'s modules. When another module calls `errmsg`, it passes a single parameter of type `BYTE`.

The procedure begins by reserving enough memory for the parameter `errnum`, a string and two integers. The two integer variables hold the horizontal and vertical position of the mouse pointer. They are passed to the procedure `getKey`, along with a string variable named `Key`.

To turn on proportionally spaced type and create an overlay window `errmsg` first uses `gfx2` calls. It then runs the *MaxIc* procedure `winset` to draw a double box border in the window and places the cursor at the upper right-hand corner of the window with `gfx2`'s `curxy` command.

With the cursor in place, it prints the message `Error - 216 - encountered`. If the error number `errmsg` receives in the parameter `errnum` is 2, then the user has

pressed the `BREAK` key. In this case, `errmsg` closes its window using the `gfx2 owend` command and ends.

If the error number received has any other value, `errmsg` uses a BASIC09 call to OS-9's shell to print an English-language error message generated by the OS-9 utility command `error`. It then moves its cursor down three lines and prints the message `Press Key`. This lets the error message stay on the screen until the user has time to read it and analyze the problem.

### Editing the Icon

Two of *MaxIc*'s procedures — `editor` and `updatbuf` — form the heart of the icon editor. `editor` is run by the procedure `main`, which passes three parameters containing just about anything you would ever want to know about *MaxIc*'s universe. The first parameter, `MS`, is of type `MICSYS` and contains the directory name, an array containing the names of up to 48 icons, a 144-byte long buffer containing the bit map of the icon being edited, the group number of the buffer being used, the buffer number, and the number of the icon.

The other two parameters, `IC` and `DE`, are of type `MIC` and hold a string, a byte and two integers. The data type `MIC` is presented in detail in our description of the procedure `loadbar` above.

The main purpose of `editor` is to exercise the procedure `updatbuf`. It begins by reserving enough memory to receive its three parameters from the procedure `main` and the variables needed to hold information about the position of the mouse pointer. The variable `regs`, of the data type `registers`, is a structure that looks like the 6809 microprocessor in the Color Computer 3. `RatPak` is a 32-byte array that holds the data about the mouse pointer.

`editor` immediately enters an endless loop that uses an OS-9 system call to continuously poll the Color Computer mouse. Each time the user presses the mouse button, `editor` immediately calls the procedure `updatbuf`. It passes the parameter `MS`, which contains everything `editor` knows about the icon being edited and the current position of the mouse pointer.

### Doing the Work

When `updatbuf` receives the location of the mouse pointer from `editor`, it knows which pixel to edit. Its first task is to compute which byte in the bit map holds the pixel. This done, it uses some additional calculations to remove the individual pixel from the byte. It gets the byte from the array

---

*Dale L. Puckett, a freelance writer and programmer, serves as director-at-large of the OS-9 Users Group and is a member of the Computer Press Association. His username on Delphi is DALEP; on packet-radio, KOHYD @ N4QQ; on GENie, D.PUCKETT2; and on CIS, 71446.736.*





| Addr | 0 1  | 2 3  | 4 5  | 6 7  | 8 9  | A B  | C D  | E F  | 0 2 4 6 8 A C E  |
|------|------|------|------|------|------|------|------|------|------------------|
| 0000 | 0000 | 0000 | 0000 | 0000 | 4040 | 4200 | 0000 | 1151 | .....@B....Q     |
| 0010 | 0A80 | 0000 | 0554 | 0A80 | 0000 | 1445 | 0100 | 0000 | ....T....E....   |
| 0020 | 1555 | 0100 | 0004 | 1405 | 0540 | 0014 | 0554 | 0500 | .U.....@...T..   |
| 0030 | 0001 | 0150 | 1100 | 0000 | 4040 | 4100 | 0000 | 1555 | ...P....@A....U  |
| 0040 | 0100 | 0000 | 0150 | 0100 | 0000 | 0150 | 0100 | 0001 | ....P....P....   |
| 0050 | 4150 | 0000 | 0044 | 1550 | 0000 | 0050 | 0550 | 0000 | AP...D.P...P.P.. |
| 0060 | 0054 | 0514 | 0000 | 0000 | 1405 | 0000 | 0000 | 1401 | .T.....          |
| 0070 | 4000 | 0000 | 1501 | 5400 | 0000 | 0000 | 0000 | 0000 | @.....T.....     |
| 0080 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | .....            |

Table 1. *Maxlc* Icon Dump

that holds the buffer containing the bit map of the icon passed in the byte field of the parameter *MS*. (Now say *that* three times, fast!)

Once *updatbuf* knows the location of the pixel, it sets the pixel to the color selected in the box along the top of *Maxlc*'s screen and puts the pixel back in the same byte in the buffer where it found it. It then changes the color of that pixel in the edit

window so the user can see what has been accomplished. However, in the edit window each pixel appears as a bar eight pixels wide and four pixels high. I guess that's why they're called fatbits.

After *updatbuf* reprints the bit map in the edit window, it reprints the actual-size image of the icon in the box at the upper left-hand corner of *Maxlc*'s screen. It does this by using the *gfx2 put* command to

place the updated buffer holding the icon at that location. When these changes are made, *updatbuf* ends and control returns to the procedure editor, which continues to monitor the position of the mouse pointer — waiting for the user to push the button so it can call *updatbuf* again.

### Reading, Saving and Showing Icons

The remainder of *Maxlc*'s modules deal

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with moving the icon to be edited into the edit window and displaying it on the screen. To help understand what these routines are doing, study the format of OS-9's icon files by looking at the dump of the file `icon.maxlc` shown in Table 1.

It also may help you to study the list below, which shows the buffer number *Maxlc* uses to hold its action buttons and the icon being edited.

| Buffer # | Contains          |
|----------|-------------------|
| 41       | Load buffer       |
| 49       | Icon being edited |
| 50       | Empty buffer      |
| 51       | <i>Maxlc</i> icon |
| 52       | Open button       |
| 53       | Save button       |
| 54       | Kill button       |

The *Maxlc* procedure `main` runs the procedure `geticon` when the mouse button is pressed. This happens while the pointer is located over the small window at the upper left-hand corner of the screen. `geticon` receives the parameters `MS`, `Dr` and `Ic` from `main`. It begins its work by clearing the small icon window. It then follows the mouse pointer and displays the appropriate buffer at the location of the pointer.

If the mouse pointer is located in the window displaying the directory, `geticon` displays the save button and runs the procedure `saveicon` to do the job. If the pointer is located near the *Maxlc* icon with the wastebasket above the edit window, `geticon` displays the Kill button and runs the procedure `clearbuf` to clear the icon buffer. It knows where the mouse pointer is located by reading the horizontal and vertical fields of the parameter `MS` it received from the procedure `main`. Before it exits, `geticon` always updates the icon directory's display by running the procedure `showdir`.

*Maxlc* uses the procedure `readicon` to load an icon from the icon directory into a buffer so it may be edited. It begins its work by displaying the hourglass pointer to let the user know it's working. Then it opens a path to the icon file, using the name it received in the parameter `Ic.name`. After it has successfully opened the file, it reads the icon data one line at a time. As it reads each line, it converts each pair of Hex bytes into two single bytes and stores those two bytes into the 144-byte array `MS.bytc`.

The `gfx2 gpload` command is used to load each of the 144 bytes into the buffer. This done, the `gfx2 put` command is used to display the icon in the update window at the upper left-hand corner of the screen. Before ending, `readicon` runs the procedure `loadbar` to tell the user which icon it is

loading, and the procedure `showicon` to display that icon in the edit window.

`showicon` receives the 144-byte buffer as a parameter, and displays it in the edit

buffer. It does this by displaying an eight-pixel-wide-by-four-pixel-deep bar to present each actual pixel in the icon. This done, it exits.

|                     |  |
|---------------------|--|
| <code>ba</code>     | Sets allocation bitmap bits for a specified LSN or range.                              |
| <code>bd</code>     | Clears allocation bitmap bits for a specified LSN or range.                            |
| <code>ccheck</code> | Scans disk for defective sectors and identifies any files stored in defective regions. |
| <code>fcheck</code> | Generates a fragmentation report.  |
| <code>hdb</code>    | Streaming device-based hard disk backup with data compression.                         |
| <code>hdr</code>    | Streaming device-based hard disk restore with data expansion.                          |
| <code>repack</code> | Hard disk optimizer; merges segments and reorganizes storage.                          |
| <code>stash</code>  | Marks files or directories that should not be repacked.                                |
| <code>zap</code>    | Erases a file's directory entry.   |

**Table 2. File System Repack Utility Programs**

*Editors Note: While all of the procedures required for Maxlc appeared on the August 1989 issue of RAINBOW ON DISK, only the procedures listed here are on this month's disk.*

#### Listing 1: `geticon`

```

PROCEDURE geticon
0000 TYPE Mic=NAME:STRING; select:BYTE; xpos,ypos:INTEGER
0010 TYPE MicSys=Dname,Iname(40):STRING; byt(144),GrpID,BufNo,number
    ,MenSel,MenuNum,ErrNum,color,scount:BYTE; horiz,vert:INTEGER
0064 PARAM MS:MicSys
0060 PARAM dr,ic:Mic
007A DIM button:BYTE
0081 ON ERROR GOTO 10
0087 (* place icon in update window
00A5 RUN gfx2("put",MS.GrpID,50,26,13)
00C1 RUN gfx2("color",1)
00D1 REPEAT
00D3 (* use non sleep mouse for this
00F3 RUN mouset(MS.horiz,MS.vert,button)
0100 (* keep track where we are and use the correct pointer
0143 IF MS.horiz>260 AND MS.horiz<590 AND MS.vert>30 AND MS.vert
    <160 THEN
0172 (* use save pointer
0185 RUN gfx2("gcset",MS.GrpID,53)
0190 RUN gfx2("put",MS.GrpID,49,26,13)
01B9 ELSE
0180 IF MS.horiz>60 AND MS.horiz<130 AND MS.vert<25 THEN
01E0 (* use kill pointer
01F3 RUN gfx2("gcset",MS.GrpID,54)
020B ELSE
020F (* buffer pointer
0220 RUN gfx2("gcset",MS.GrpID,49)
0230 RUN gfx2("put",MS.GrpID,50,26,13)
0254 ENDIF
0256 ENDIF
0258 UNTIL button<>0
0263 RUN gfx2("color",MS.color)
0278 RUN gfx2("put",MS.GrpID,49,26,13)
0294 IF MS.horiz>260 AND MS.horiz<590 AND MS.vert>30 AND MS.vert
    <160 THEN
02C3 (* we want to save it
02D8 RUN saveicon(MS,dr,ic)
02EC ENDIF
02EE IF MS.horiz>60 AND MS.horiz<130 AND MS.vert<25 THEN
0311 (* no we want to kill it
0329 RUN clearbuf(MS,dr,ic)
0330 ic.name:=""
0349 RUN gfx2("color",1)
0359 RUN gfx2("curxy",5,5)

```

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*Maxle* uses `writeln` to write a Hex dump of the icon to a file or to the printer. When an icon is sent to the printer, its name is printed first on the first line and then the Hex code is listed. If the icon file is being written to a disk file, this first line is not written to the file.

From two string parameters that are passed to it, `writeln` receives the name of the icon and the filename. An array containing the 144-byte bit map of the icon is passed to `writeln` in another parameter. If the user is trying to print an icon that has been cleared, `writeln` exits immediately. Otherwise it opens a path to the file or printer and proceeds to print each byte in the 144-byte array in Hex format. It prints two bytes at a time and then inserts a space. If you study the listing of the file `icon.maxic` in Table 1, you'll see this is the format used by all OS-9 icon files. Each icon file contains nine lines holding 16 bytes each.

*Maxle* runs the procedure `saveicon` after the user has finished editing the icon and is ready to write it to disk. This procedure is called by the procedure `files`, which is called in turn by the procedure `main` when the user clicks the mouse button over the File entry in the menu bar. Save is Item 3 in the File menu, and `saveicon` is run when you click the mouse button over the word.

`saveicon` receives three parameters from the procedure `files` — `MS`, `Dr` and `Ic`. All three have been described previously in this article. The first action taken by `saveicon` is to prompt the user for a filename. It does this by running the procedure `getname`.

If the file already exists, it prompts to find out if you want to overwrite the old file. It uses the procedure `getans` to accomplish this. Just before it opens a path to a file with the name supplied by the user, `saveicon` searches through the icons in the current icon directory until it gets a match. When it finds the icon request, it puts the buffer number and icon name in the proper fields of the variable `MS`.

Once the file is open, `saveicon` uses the `gfx2 gpload` command to move the icon from the screen into the 144-byte array, `byt`, in Variable `MS` and into the file. It then runs the procedure `showdir` to update the display of the icon directory. This means the freshly edited icon appears in the directory in its new form. If the icon file you request does not already exist, `saveicon` creates it. After `saveicon` writes an icon to a new disk file, it uses the BASIC09 shell statement to run the OS-9 utility command `attr` to set the private and public execute attributes of the file.

This wraps up our three-part tutorial series covering Robert Moody's icon editor *Maxle*. I hope we have helped you learn a

```

036C      PRINT "
0383      ENDIF
0385      MS.horiz:=0 \MS.vert:=190
039B      dr.name:=""
03A6      (* now let's see what we did
03C2      RUN showdir(MS.dr)
03D1      END
03D3 10   MS.ErrNum:=ERR
03E0      (* was error doing nothing in update window
040B      RUN gfx2("put",MS.GrpID,49,26,13)
0427      RUN errmsg(MS.ErrNum)
0434      END

```

## Listing 2: saveicon

```

PROCEDURE saveicon
0000      TYPE Mic=NAME:STRING; select:BYTE; xpos,ypos:INTEGER
001B      TYPE MicSys=0name,Iname(48):STRING; byt(144),GrpID,BufNo,number
           ,MenSel,MenNum,ErrNum,color,scount:BYTE; horiz,vert:INTEGER
0064      PARAM ms:MicSys
006D      PARAM Dr,Ic:Mic
007A      DIM path:BYTE
0081      DIM ok:BOOLEAN
0088      ON ERROR GOTO 10
008E      (* is the editor name blank
00A9      IF Ic.name="" THEN
00B9          (* if so let's try to get one
00D6          RUN getname(Ic.name)
00E3          IF Ic.name="" THEN
00F2              (* could not get one so let's end
0113                  END
0115          ENDIF
0117      ENDIF
0119      (* let's show the disk is busy
0137      RUN gfx2("gcset",202,4)
014A      (* start at the top of buffer +1
016A      ms.Iname(ms.number+1):=Ic.name
0182      ms.BufNo:=ms.number+1
0194      FOR x:=1 TO ms.number+1
01AD          (* did we find a match
01C3          EXITIF Ic.name=ms.Iname(x) THEN
01DA              (* yes so use the same buffer
01F7                  ms.BufNo:=x
0204                  ms.Iname(x):=Ic.name
0217          ENDEXIT
021B          NEXT x
0226      OPEN #path,ms.Dname+"/"+Ic.name:WRITE
0240      (* did it open a old file
0259      (* if so do we want to over write it
027D      RUN getans(ms,ok,"Over Write "+Ic.name)
02A1      IF ok<>TRUE THEN
02AC          (* no so close it and end
02C5              CLOSE #path
02CB              END
02CD          ENDF
02CF          (* yes so keep going
02E3          RUN gfx2("curxy",5,5)
02F6          RUN gfx2("color",1)
0306          PRINT USING "s15^".Ic.name
0316          RUN gfx2("logic","off")
0329          RUN gfx2("gpload",ms.GrpID,ms.BufNo,6,24,24,144)
0353          FOR x=1 TO 144
0365              PUT #path,ms,byt(x)
0377              PUT #ms.GrpID,ms,byt(x)
038C          NEXT x
0397          CLOSE #path
039D          IF ms.number=0 THEN
03AC              ms.number:=1
03B7              RUN gfx2("color",0,1)
03CA              RUN gfx2("color",ms.color,0)
03E2          ENDF
03E4          (* now let's the new changes
0400          RUN showdir(ms,Dr)
040F          END
0411 10   ON ERROR GOTO 20
041A      (* could not open old file so let's try to make a new one
0453      FOR x:=1 TO ms.number+1
046C          (* did we find a deleted icon
0489          EXITIF ms.Iname(x)="icon.XXXX" THEN
04A5              (* yes so let's use it
04BB                  ms.BufNo:=x
04C8                  ms.Iname(x):=Ic.name
04D8          ENDEXIT
04DF          NEXT x
04EA          (* are we going to use a unused buffer
0510          IF ms.BufNo=ms.number+1 THEN
0526              (* yes so update the number of them used

```

```

054E      ms.number:=ms.number+1
0560      RUN gfx2("propsw","off")
0574      RUN gfx2("color",0,1)
0587      RUN gfx2("propsw","on")
059A      RUN gfx2("color",1,0)
05AD      ENDIF
05AF      (* now make a new icon
05C5      CREATE #path,ms.Dname+"/"+ic.name:WRITE
05D0      RUN gfx2("curxy",5,5)
05F2      RUN gfx2("color",1)
0602      PRINT USING "s15^",ic.name
0612      RUN gfx2("logic","off")
0625      RUN gfx2("gpload",ms.GrpID,ms.BufNo,6,24,24,144)
064F      FOR x=1 TO 144
0661          PUT #path,ms.bytx)
0673          PUT #ms.GrpID,ms.bytx)
0688      NEXT x
0693      CLOSE #path
0699      (* error in ow window
06AE      ON ERROR GOTO 30
06B4      RUN gfx2("owset",1.5,5,25,8,3,1)
06D6      RUN winset(4)
06DE      RUN gfx2("curxy",1,0)
06F1      (* now let's change the attr on it
0713      PRINT "ATTR "; ic.name; " pe e"
072B      RUN gfx2("curxy",1,2)
073E      SHELL "attr "+ms.Dname+"/"+ic.name+" e pe"
0761      (* give time to see the job was done
0785      FOR x:=1 TO 3000 \NEXT x
07A3      RUN gfx2("owend")
07B0      (* error no ow window
07C5      ON ERROR GOTO 20
07CB      (* let's see the new icon
07E4      RUN showdir(ms,Dr)
07F3      END
07F5 20  ms.ErrNum:=ERR
0802      (* report error
0811      RUN errmsg(ms.ErrNum)
081E      END
0820 30  ms.ErrNum:=ERR
082D      (* error in attr ow window
0847      RUN gfx2("owend")
0854      RUN errmsg(ms.ErrNum)
0861      END

```

### Listing 3: readicon

```

PROCEDURE readicon
0000      TYPE MicName:STRING; select:BYTE; xpos,ypos:INTEGER
001B      TYPE MicSys=Dname,Iname(48):STRING; byt(144),GrpID,BufNo,number
           ,MenSel,MenuNum,ErrNum,color,scount:BYTE; horiz,vert:INTEGER
0064      PARAM MS:micSys
006D      PARAM dr,IC:mic
007A      DIM temp:STRING[39]
0086      DIM path,count:BYTE
0091      DIM Thyt1,Thyt2:STRING[3]
00A1      (* start at number 1
00B5      count:=1
00BC      ON ERROR GOTO 10
00C2      (* show we are busy
00D5      RUN gfx2("gcset",202.4)

```

few of the techniques you must master to write fantastic mouse-driven programs under OS-9's *Multi-Vue* environment.

### Getting Rid of Disk Fragments

Occasionally I notice a lot of confusion in the Color Computer community about file fragmentation. The topic is a real concern because OS-9 constantly moves files between main memory and your hard or floppy disks. The work is done by RBF — OS-9's Random Block File manager. RBF keeps track of where data is stored on your disks by dividing your disk into three regions; an identification sector, an allocation bitmap and the file system.

There are many myths about file fragmentation. Chris Burke of Burke & Burke posted an outstanding file concerning the subject on CompuServe. It's recommended reading. In summary Burke says fragmentation is a natural side effect of disk operation. It is caused by the constant rearrangement of disk data as files are created, modified and deleted.

Three problems caused by fragmentation are disk errors (Segment List Full and Device Full), slower disk access and increased mechanical wear. Although backups don't affect fragmentation, you can reduce or eliminate it by periodically backing up and restoring your hard drive or by using a hard disk optimizer program. You may especially want to check out Chris's tutorial file if you experience either of these symptoms:

**Error 217 — Segment list full.** The file has reached the built-in fragmentation limit of 48 segments.

**Error 248 — Device full.** When you run `ezgen`, `cobbler`, `config` or `os9gen`, this error code means that OS-9 couldn't find any group of clear ABM (Allocation Bit Map) bits large enough to create a single-

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segment file. The disk may actually be full, or it may be badly fragmented.

If you would rather solve the problem than read about it, Burke & Burke has a solution for you. It's written a new utility package called File System Repack (FSR), a collection of nine OS-9 disk utility programs. The programs included are listed in Table 2.

The most important of these programs is `repack`, the hard disk optimizer. `repack` scans a disk's OS-9 file system and rewrites any files or directories that are stored inefficiently. Here are a few of `repack`'s advantages.

- Individual files processed by `repack` are optimized permanently. Only editing or otherwise modifying the file undoes its optimization.
- Command line options allow `repack` to reclaim lost sectors on a disk.
- `repack` sorts files in order of increasing file descriptor address. In this way `repack` preserves the general order of your disk files without changing their order in the directory.
- No free disk space is needed; `repack` can even repack a completely full hard disk.
- It works on any type or brand of OS-9 hard/floppy disk.

### OS-9 for DOS and Mac

OS-9 Users Group MOTD editor Bill Brady and I flew to Chicago's O'Hare airport in August for the introduction of two new OS-9 implementations. One port runs on an IBM PC, XT or AT with the help of a plug-in card called the PC68K1. The plug-in card has two standard DB9 serial ports that can run to 19.2 kilobaud asynchronous or synchronous and two eight-bit, bi-directional parallel ports. The card runs OS-9 concurrently while MS-DOS runs on the PC itself. The two operating systems can communicate with each other. Power users may plug the Memiox 10-port serial expansion board into the PC68K1 and run with a dozen users. We'll be detailing the PC68K1 in an article for RAINBOW's sister magazine PCM.

There are three Mac implementations. All use the Macintosh *Quickdraw* and disk operating system for I/O. This means new OS-9 device drivers won't need to be written for each piece of hardware added to your Macintosh. It also means that any piece of hardware that runs with the Macintosh should be ready for use by OS-9. The three implementations are for the Plus and SE, which use the Motorola 68000 processor, the Mac II and its 68020 processor, and the SE 30 and Mac IIX, which use a 68030 microprocessor.

```

00E8 OPEN #path,IC.name
00F5 (* nine lines to read
010A FOR x:=1 TO 9
011C (* read them as strings
0133 READ #path,temp
013D (* the string is forty bytes long so stop at every 5th spot
0179 FOR xx:=1 TO 40 STEP 5
0191 (* now make the next two a hex string byte size
01C0 Tbyt1:="$"+MID$(temp,xx,2)
01D3 Tbyt2:="$"+MID$(temp,xx+2,2)
01EA (* now make them bytes
0200 MS.by(count):-VAL(Tbyt1)
0211 MS.by(count+1):-VAL(Tbyt2)
0225 (* move it up by two
0239 count:=count+2
0244 NEXT xx
024F (* get next string to read
0269 NEXT x
0274 CLOSE #path
027A RUN gfx2("gpload",MS.GrpId,41,6,24,24,144)
029F FOR x=1 TO 144
02B1 PUT #MS.GrpId,MS.by(x)
02C6 NEXT x
02D1 (* done so place it in the update window
02F9 RUN gfx2("put",MS.GrpId,41,26,13)
0315 (* blank the editor
0328 RUN loadbar(IC.name)
0335 (* now load it with the icon
0351 RUN showicon(MS.by)
035E END
0360 10 MS.ErrNum:=ERR
036D RUN errmsg(MS.ErrNum)
037A END

```

### Listing 4: showicon

```

PROCEDURE showicon
0000 PARAM Byt(144):BYTE
000C DIM x,y,Bit:INTEGER
0018 DIM pixel,color:BYTE
0026 DIM BtNum,PixNum:INTEGER
0031 ON ERROR GOTO 10
0037 BASE 0
0039 (* get pixel from the byte
0053 PixNum:=0
005A (* start from top left move down
007A FOR y:=60 TO 175 STEP 5
008F (* first go right in step of 9
00AD FOR x:=32 TO 239 STEP 9
00C2 (* convert bytes to four pixels
00E1 BtNum:=PixNum/4
00EC Bit:=-3-MOD(PixNum,4)
00FA pixel:=-4^Bit
0108 (* and get the color of it
0122 color:=-LAND(Byt(BtNum),pixel*3)/pixel
0138 RUN gfx2("color",color)
014A (* and draw it in the editor
0166 RUN gfx2("bar",x,y,x+8,y+4)
0189 (* move over to next pixel
01A3 PixNum:=PixNum+1
01AE NEXT x
01B9 NEXT y
01C4 END
01C6 10 RUN errmsg
01CD (* report errors

```

### Listing 5: writeicon

```

PROCEDURE writeicon
0000 PARAM Name,Tname:STRING
000B PARAM Bytes(144):BYTE
0017 DIM path,ErrNum:BYTE
0022 (* is the name chr$(32)
0039 IF Name="" THEN
0046 (* yes so end
0053 END
0055 ENDIF
0057 ON ERROR GOTO 10
005D (* we are busy so time for the hour glass
0086 RUN gfx2("gcset",202,4)
0099 (* let's try to open old file
00B6 OPEN #path,Name:WRITE
00C2 (* start at 0
00CF xx:=0

```

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The *Quickdraw* terminal emulator was not finished at show time, so we did not get to see the Mac run OS-9 on its own screen in Chicago. However, both Bill and I have signed up as Beta testers of the new OS-9 implementations. This means we should have plenty to say sometime soon. In the meantime it's a great step forward for our favorite operating system.

Dr. Erich Gibbs, president of Gibbs Laboratories, the company that designed these new OS-9 products, is on the right track. His goal? "To greatly enhance the productivity of popular personal computers conveniently and inexpensively."

Gibbs believes his contributions will "go a long way toward restoring a healthier competitive balance between the computing power of small organizations and that of large organizations." He noted that the benefit of his new products will be "especially significant on the broad lower rungs of the economic ladder where getting the most from a personal computer is a matter of practical importance."

The OS-9 approach just may be appealing. The alternative is networking. When computers are networked, companies must buy a full-fledged computer for each workstation. Many small companies cannot afford to buy a half dozen computers. "But they could afford to buy one computer and a half dozen inexpensive terminals," Gibbs said. "OS-9 can handle the job nicely. We think we have a winner."

For OS-9 users, Gibbs Laboratories' innovation could be a boon. OS-9 may suddenly be available on machines that you can buy off the shelf at any computer store anywhere. We just may see some new software. I'll keep you posted.

### Color Canvas

Mike Haaland's *MVCanvas* will more than likely be shipping by the time you read this column. It's a fantastic new package that should make RS-DOS users sit up and take notice. It's 100-percent mouse- and menu-driven and offers support for most printers.

*MVCanvas* supports Files, Edit, Goodies, Tools and Font Menus. It needs *Multi-View*, a 512K CoCo 3 and one disk drive. Essentially it's an easy-to-use VEF format graphics editor that features a clipboard, palette switching and multiple fonts. It can import digitized pictures and edit full 320-by-200, sixteen-color VEF pictures.

Give Haaland a call at Hyper-Tech Software, 4341 Gannet Circle, Suite 174, Las Vegas, NV; (702)-362-5346. This one really sings!

That's it for November. Enjoy your turkey and keep on hacking. □

```

0007      (* is it to the printer
000E      IF Name="/p" THEN
000F      (* yes so let's print out a name
011C      PRINT #path USING "s40^",Iname
012D      ENDIF
012F      (* write it in steps of 2
0148      FOR x=-1 TO 144 STEP 2
0160      PRINT #path USING "h?",Bytes(x);
0174      PRINT #path USING "h?",Bytes(x+1);
018C      (* with a blank space between them
01AE      PRINT #path," ";
01B9      (* move it up by one
01CD      xx:=xx+1
0109      (* did we reach number 8 yet
01F5      IF xx=8 THEN
0202      (* yes so send a chr$(13) out
021F      PRINT #path
0225      (* move it back to 0
0239      xx:=0
0241      ENDIF
0243      NEXT x
024E      PRINT #path
0254      CLOSE #path
025A      END
025C 10  ON ERROR GOTO 20
0265      (* did not find a old file so make a new one
0291      CREATE #path,Name:WRITE
029D      (* and do the same thing here
02BA      xx:=0
02C2      FOR x=-1 TO 144 STEP 2
02DA      PRINT #path USING "h?",Bytes(x);
02EE      PRINT #path USING "h?",Bytes(x+1);
0306      PRINT #path," ";
0311      xx:=xx+1
031D      IF xx=8 THEN
032A      PRINT #path
0330      xx:=0
0338      ENDIF
033A      NEXT x
0345      CLOSE #path
034B      END
034D 20  ErrNum:=-ERR
0356      (* report error
0365      RUN errmsg(ErrNum)
036F      END

```

### Listing 6: editor

```

PROCEDURE editor
0000      TYPE MicSys=Dname,Iname(48):STRING; byt(144),GrpId,BufNo,number
           ,MenSel,MenuNum,ErrNum,color,scount:BYTE; horiz,vert:INTEGER
0049      PARAM Ms:micSys
0052      TYPE registers=dp,a,b,cc:BYTE; x,y,u:INTEGER
0077      DIM regs:registers
0080      DIM Callcode:BYTE
0087      DIM RatPack(32):BYTE
0093      ON ERROR GOTO 10
0099      (* let stay here for a while
00B5      LOOP
00B7      (* use small cross hire pointer
00D6      RUN gfx2("gcset",202,7)
00E9      REPEAT
00EB      (* mouse info
00F0      regs.a:=0
0103      regs.b:=-$89
010F      regs.x:=ADDR(RatPack)
011D      regs.y:=0
0128      Callcode:=-$8D
0130      RUN syscall(Callcode,regs)
013F      (* set horiz pos for cross hire
015E      Ms.horiz:=RatPack(25)*256+RatPack(26) \Ms.horiz:=Ms.horiz
           +Ms.horiz/17+3
0192      (* set vert for cross hire
01AC      Ms.vert:=-192*(RatPack(31)*256+RatPack(32))/176+3
01CD      Ms.horiz:=(Ms.horiz-32)/9+9+32
01F8      Ms.vert:=(Ms.vert-60)/5+5+60
0203      IF Ms.horiz<30 OR Ms.horiz>246 OR Ms.vert<58 OR Ms.vert
           >177 THEN
0230      (* we are out of bounds so end it
0251      RUN gfx2("gcset",0,0)
0264      Ms.horiz:=1
026F      END
0271      ENDIF
0273      UNTIL RatPack(9)<>0
0280      (* button down so so let's update
02A1      RUN updatbuf(Ms)
02AB      (* and look for a new spot
02C5      ENDL00P
02C9      END
02CB 10  Ms.ErrNum:=-ERR

```



```

02D8      (* report error
02E7      RUN errmsg(Ms.ErrNum)
02F4      END

```

### Listing 7: updatbuf

```

PROCEDURE updatbuf
0000      TYPE MicSys=0name,Iname(40):STRING:byt(144).GrpId,BufNo,number
           ,MenSel,MenNum,ErrNum,color,scount:BYTE;horiz,vert:INTEGER
0049      PARAM MS:micSys
0052      DIM PixNum,Ph,Pv,pixel:INTEGER
0065      DIM Bit,BtNum:BYTE
0070      DIM xcor,ycor:INTEGER
007B      ON ERROR GOTO 10
0081      xcor:=(MS.horiz-32)/9
0092      ycor:=(MS.vert-60)/5
00A3      BASE 0
00A5      (* get the pixel out of the byte
00C5      PixNum:=xcor+ycor*24
00D4      BtNum:=PixNum/4
00DF      Bit:=-3-MOD(PixNum,4)
00ED      pixel:~4*Bit
00FB      Bit=LAND(MS.by(BtNum),pixel*3)
0110      (* now put it back in the byte with the selected color
0146      MS.by(BtNum):=MS.by(BtNum)-Bit+pixel*MS.color
016A      (* and let's show it on the editor in big size
0198      Ph:=xcor*9+32
01A6      Pv:=ycor*5+60
01B4      RUN gfx2("bar",Ph,Pv,Ph+8,Pv+4)
01U7      (* now update the buffer
01EF      RUN gfx2("logic","off")
0202      RUN gfx2("gload",MS.GrpId,49,6,24,24,144)
0227      FOR x:=0 TO 143
0239          PUT #MS.GrpId,MS.by(x)
024E      NEXT x
0259      (* and put back on the update window
027D      RUN gfx2("put",MS.GrpId,49,26,13)
0299      END
029B 10    MS.ErrNum:=ERR
02A8      RUN errormsg(MS.ErrNum)
02B5      END

```

### Listing 8: errmsg

```

PROCEDURE errmsg
0000      PARAM errnum:BYTE
0007      DIM key:STRING
000E      DIM horiz,vert:INTEGER
0019      RUN gfx2("propsw","on")
002C      RUN gfx2("owset",1,10,10,20,10,1,3)
004E      RUN winset(4)
0056      RUN gfx2("curxy",1,0)
0069      (* what was the errnum
007F      PRINT "Error -";errnum;"- Incounted"
009C      (* if not the break key
00B3      IF errnum<>2 THEN
00BF          (* can't find error or errormsg goto 1
00E3          ON ERROR GOTO 1
00E9          SHELL "error "+STR$(errnum)
00F8 1      RUN gfx2("curxy",5,4)
010E          PRINT "Press Key"
011B          (* stay here till response
0135          RUN getkey(key,horiz,vert)
0149      ENDIF
014B      RUN gfx2("owend")
0158      END

```

### Listing 9: loadbar

```

PROCEDURE loadbar
0000      (* fill the editor and show the name
0024      PARAM name:STRING
002B      RUN gfx2("color",1,0)
003E      RUN gfx2("bar",32,60,245,174)
0055      RUN gfx2("curxy",5,5)
0068      PRINT USING "s15^",name
0075      RUN gfx2("color",0,1)
0088      RUN gfx2("curxy",3,10)
0098      PRINT "Loading Icon"
00AB      END

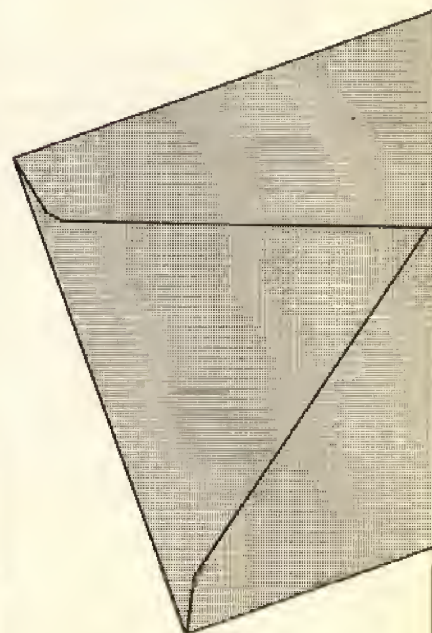
```

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# Join the Chorus!

Several years have passed since a reader survey appeared in THE RAINBOW. We have received thousands of letters with individual opinions over the years. And we have read and taken to heart each suggestion. But relying on reader mail doesn't allow us to see the complete picture very readily. To help us determine what you want, a comprehensive reader survey is in order.

On the following page you will find several questions regarding your Color Computer setup, your personal background, and your CoCo and RAINBOW habits. As you complete the survey, keep its purpose in mind. Answer all the questions as honestly as you can. It is also important to make the answers your own. We want *your* personal information and opinions. This is the only way we can effectively use the information you provide.

As with any poll or survey, it is most important that everyone take the time to respond. If the results indicate 90 percent of our readers want to see a lot of OS-9 articles, do I need to say what direction THE RAINBOW will take? Obviously, lop-sided results won't serve any of us well.

When you have finished, remove the page from the magazine, fold it and mail it to us at:

Reader Survey  
The Rainbow  
P.O. Box 385  
Prospect, KY 40059

Alternatively, if you want to keep your RAINBOW magazine intact, photocopy the page after finishing and mail us the copy. Then you will have a record of your responses.

\*\*\*\*\*

Hold the presses! Last month I reported our selection of a Courier typeface for the listings we publish. Further experimentation has provided a solution that makes RAINBOW listings even easier to read. Beginning with this issue we are using a Letter Gothic Bold typeface. This font is tight enough for us to use three-column listings and heavy enough that you shouldn't need to squint. Thanks for bearing with us as we undergo these changes.

Another change some of you may have noticed is the elimination of the Rain-

bowtech section of the magazine. No, this doesn't mean we are planning to cancel the columns that usually appear there (specifically "Barden's Buffer" and "KISSable OS-9"). Rather, we feel the Rainbowtech designation has outlived its purpose. We publish technical articles relevant to several aspects of the CoCo throughout THE RAINBOW.

The removal of the Rainbowtech designation also allows us to standardize the format of RAINBOW's features and columns. This gives the magazine a more flexible yet consistent layout.

Remember, our goal is to make THE RAINBOW as easy to read and as enjoyable as possible. You'll see many minor changes in the physical presentation of the magazine. On a larger scale, we depend on you to tell us the direction we need to take. Fill out and return the reader survey, and let your voice be heard.

— Cray Augsburg

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**Occupation:**  
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## About Your CoCos (circle all that apply)

**Computer:**  
 CoCo 1 CoCo 2 CoCo 3  
 Color BASIC Extended BASIC Disk BASIC  
 4K 16K 32K  
 64K 128K 512K

**Printer:**  
 C.Itoh Epson Okidata  
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**Monitor:**  
 B/W Television Color Television Monochrome  
 Color Composite RGB RGB/Composite

**Alternate DOS:**  
 Flex ADOS RGB DOS  
 JDOS CDOS Hyper-I/O

**Do you have a hard drive?** Yes No

**If so, how do you use it?**  
 Disk BASIC only OS-9 only Disk BASIC and OS-9

**What percentage of the time do you use Disk BASIC?**  
 0 10 20 30 40 50 60 70 80 90 100

**What percentage of the time do you use OS-9 Level I?**  
 0 10 20 30 40 50 60 70 80 90 100

**What percentage of the time do you use OS-9 Level II?**  
 0 10 20 30 40 50 60 70 80 90 100

**Describe your main system:** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Describe any other computers you have and use:** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## Your Wish List

On a scale of 1 to 5 (5 being the highest), rate your interest in each of the following:

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| <input type="checkbox"/> Beginner's info    | <input type="checkbox"/> BASICally Speaking   |
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| <input type="checkbox"/> OS-9               | <input type="checkbox"/> Scoreboard           |
| <input type="checkbox"/> Reviews            | <input type="checkbox"/> Scoreboard Pointers  |
| <input type="checkbox"/> Sound and music    | <input type="checkbox"/> Turn of the Screw    |
| <input type="checkbox"/> Technical Q&A      | <input type="checkbox"/> Wishing Well         |
| <input type="checkbox"/> Telecommunications | <input type="checkbox"/> Wrapping the Rainbow |
| <input type="checkbox"/> Tutorials          |   |
| <input type="checkbox"/> Utilities          |   |

**Do you receive Rainbow On Tape?** Yes No

**Do you receive Rainbow On Disk?** Yes No

**Do you type in Rainbow listings?**  
 Frequently Sometimes Never

**Are Rainbow listings**  
 Too long Too short Just right

**Regarding the listings, are there**  
 Too many Too few Just right

**Do you use Rainbow Check Plus?** Yes No

**Do you use Racksellers to locate The Rainbow?** Yes No

**Comments and Suggestions:** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_  
 State \_\_\_\_\_ Zip \_\_\_\_\_

Send completed survey to: Reader Survey, The Rainbow, P.O. Box 385, Prospect, KY 40059.

## ☞ New Calligrapher Graphics Clipix! ☜

Introducing 8 disks of graphics pictures I call **Clipix**. Each disk has over 60 pictures. The introductory price of **just \$49.95** (save \$30) for the complete set is available through Dec. 31st, 1989. Specify RS-DOS, OS9 or MS-DOS format.

### CALLIGRAPHER

**CoCo Calligrapher** - Turn your CoCo and dot-matrix printer into a calligrapher's quill. Make beautiful invitations, flyers, certificates, labels and more. Includes three ½ inch high fonts. Works with many printers such as Epson, Gemini and Radio Shack. Over 135 additional fonts are available (see below). Tape/Disk (RS-DOS); **\$24.95**.

**Calligrapher V2.0** - Prints all the same fonts as the CoCo Calligrapher. It reads a standard text file which contains text and formatting codes. You specify the fonts, centering, left, right or full justify, line fill, margin, line width, page size, page break, page numbers, indentation, multiple columns, macros, headers, footers and more. Includes the same 3 fonts with additional fonts available below. Disk only; Specify OS9 or MS-DOS; **\$24.95**.

**Calligrapher Fonts** - Requires Calligrapher above. Each set on tape or disk with 8 to 10 fonts; Specify RS-DOS, OS9 or MS-DOS format; **\$14.95** each:

- Set #1 Reduced and reversed originals;
- Set #2 Old Style and Broadway;
- Set #3 Antique and Business;
- Set #4 Wild West and Checkers;
- Set #5 Stars, Hebrew and Victorian;
- Set #6 Block and Computer;
- Set #7 Small: Roman, Italics, Cubes, etc;
- Set #8 Novelty fonts;
- Set #9 Gallant and Spartan;
- Set #10 Several Roman fonts;
- Set #11 Gothic and Script;
- Set #12 More Roman and Italic;
- Set #13 Several Courier fonts;
- Set #14 Modern and Screen;
- Set #15 Tektron and Prestige.

**Economy Font Packages** available on disk only, with 25 to 30 fonts; Specify RS-DOS, OS9 or MS-DOS format; **29.95** for any one or save by buying two or more at **\$19.95** each:

- Pkg #1 - Above font sets 1, 2 and 3;
- Pkg #2 - Above font sets 4, 5 and 6;
- Pkg #3 - Above font sets 7, 8 and 9;
- Pkg #4 - Above font sets 10, 11 and 12;
- Pkg #5 - Above font sets 13, 14 and 15.


**Calligrapher Combo Package** - Includes the Calligrapher and any two Economy Font Packages (your choice) for only **\$59.95**. Specify RS-DOS, OS9 or MS-DOS.

### New! Calligrapher Graphics Clipix

The Calligrapher may now include graphics pictures, known as **Clipix**, along with the text it prints. There are currently 8 different Clipix disks available, each one has over 60 different graphic symbols. While the OS9/MS-DOS Calligrapher (especially V2.0) may easily combine both text and Clipix, the RS-DOS Calligrapher may also print out the Clipix. Clipix #1) Sports, #2) Miscellaneous, #3) Occupations, #4) Occasions, #5) Vehicles, #6) KidStuff, #7) Astrology/Mythology, #8) Animals. Each Clipix disk is **\$9.95**. See special offer above.



**The Font Massager** - This program allows you to do many things to Calligrapher font and Clipix files. Create new fonts, modify existing fonts, invert and compress fonts, double the height and/or width, halve the height and/or width and convert between RS-DOS and OS9/MS-DOS formats. Specify OS9 or MS-DOS; **\$19.95**.

 This is a sample of the dot-matrix printer output from the OS9 MS-DOS Calligrapher set to full-justify the text within a 2.2 inch wide column. The font used is the 12-point Courier font from the font set #15 (or package #5).

For a complete catalog of Sugar Software products and fonts, send a stamp and a label.



**SUGAR SOFTWARE**

P.O. Box 7446  
Hollywood, Florida 33081  
(305) 981-1241

All programs run on the CoCo 1, 2 and 3, 32K Extended Basic, unless otherwise noted. Add \$1.50 per tape or disk for shipping and handling. Florida residents add 6% sales tax. COD orders add \$5. Dealer inquiries invited. Orders generally shipped in 24-48 hours. No refunds or exchanges without prior authorization.

# Racksellers

The retail stores listed below carry **THE RAINBOW** on a regular basis and may have other products of interest to Tandy Color Computer users. We suggest you patronize those in your area.

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# UltiMusE III

The Ultimate Music Editor for the CoCo 3

"What if...  
all CoCo music programs were this good?"

UltiMusE III is a MIDI 'Notation Sequencer'. It lets you write and edit sheet music on a 640x192 graphics screen using the mouse, play it on ANY MIDI-equipped synthesizer(s), and print out the score... Written by an experienced computer professional who is also a serious amateur musician and composer. With UltiMusE III, there is no more 'faking' to play what you want to hear! Perfect for the trained musician, UltiMusE III's natural notation also helps a beginner to copy a favorite piece of sheet music just as it looks. Why should your music sound like a machine? UltiMusE III has a wide pitch range, from 4 octaves below Middle C to over 3 above. Each staff has a 4-octave range centered on one of four clefs - Treble, Guitar, Bass, and Double Bass. Staff placement, clefs, and part and MIDI channel assignments can ALL be edited... Professional software should use a professional Operating System. UltiMusE III uses the advanced features of OS-9 Level II and does not interfere with its windowing and multi-tasking in any way.

**SYSTEM REQUIREMENTS:** CoCo 3 with at least 256K memory, OS-9 Level 2, Mouse or Joystick (Hi-Res Joystick Adapter recommended), Synthesizer(s) with MIDI-In jack, plus a Serial to MIDI cable. Tandy's DMP printer, a MIDI Interface Pak, and a Multi-Pak are optional equipment.

**UltiMusE III**  
**\$54.95**

CASIO MT-240 MIDI KEYBOARD ..... \$149.95  
A/C POWER ADAPTER ..... \$14.95  
SERIAL TO MIDI CABLE ..... \$19.95

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'FINAL EDITION' is just a news print slogan meaning the very latest published issue. In the case of Newspaper Plus - Final Edition, it means the latest upgrade is NOW available. Here are some of the added features being offered;

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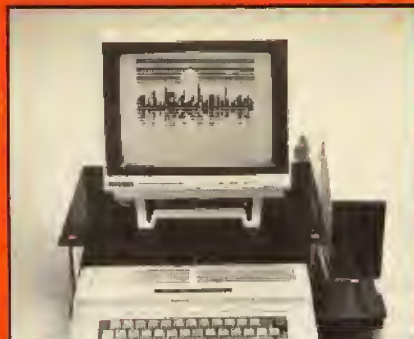
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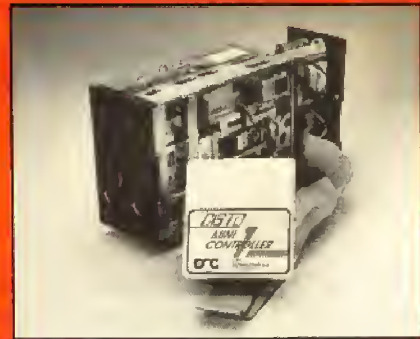
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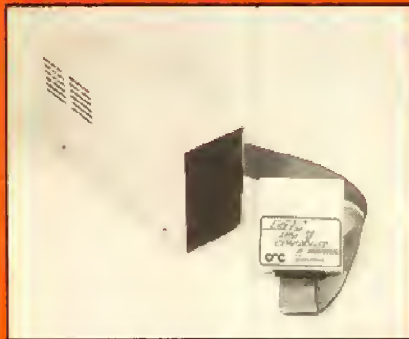
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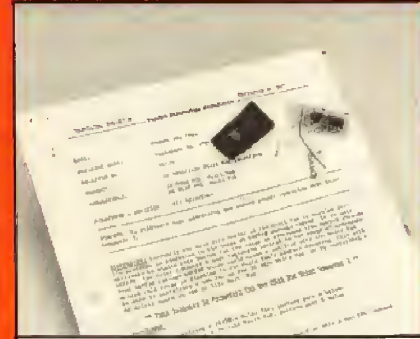
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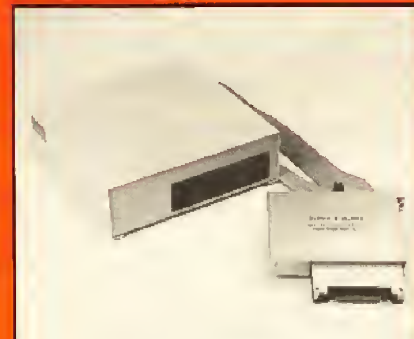
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See Rainbow Reviews 8/89

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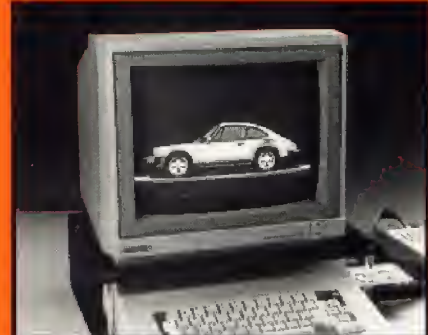


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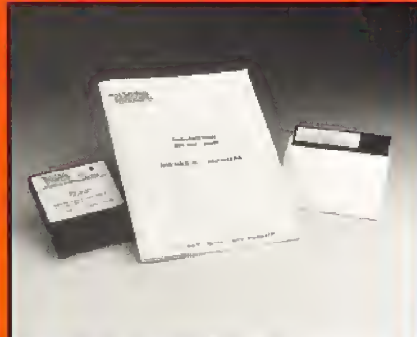
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